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PAGE 134

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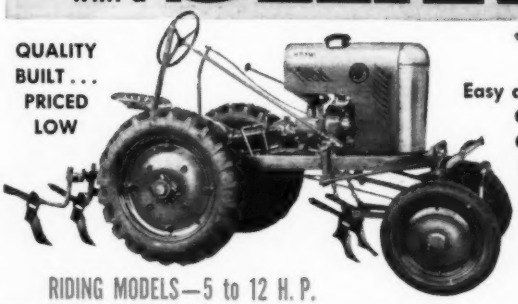

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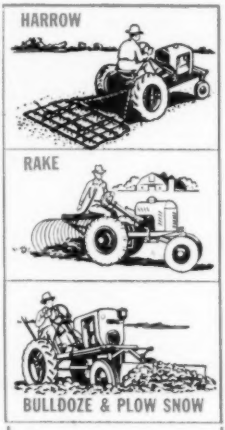

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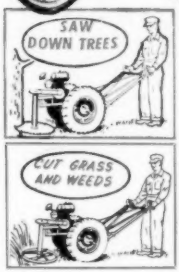

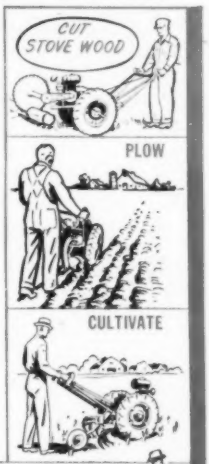

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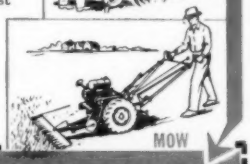

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Mechanics and Handicraft

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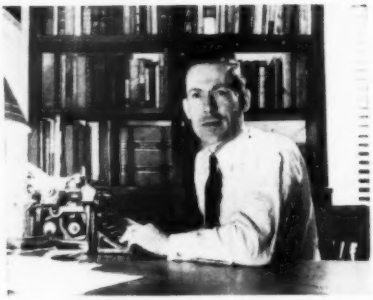
NEXT MONTH . . .

How to Drill for Water



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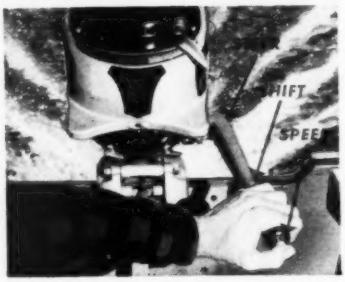

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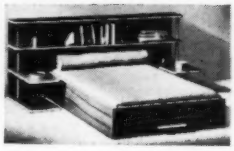

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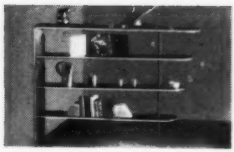
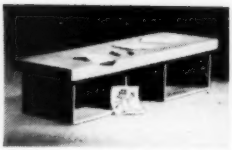
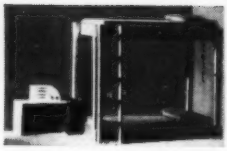


Shelves to divide a room—easily made of low-cost stock lumber, with simple hand tools.



Children can use this as a play table. But as they grow up it becomes a handsome desk!



Complete working drawings and instructions show how to make this attractive bunk bed.

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Letters

Drills Find Their Mark

I was extremely pleased with your article in the December, 1951, issue entitled "Let's Talk About Drills and Drilling" [p. 221].

It has been very difficult for us to impress upon our employees the importance of accurate drill grinding, and we have been searching for some means to explain in a simple fashion the proper techniques. I think your article is the best I have seen on this subject.

N. R. Clark Jr., McQuay-Norris Mfg. Co.
Connersville, Ind.

M Means Thousand

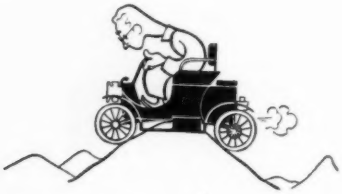
In the wiring diagram accompanying the article "I Locate Rattles with a Stethoscope" on page 187 of the October, 1951, issue you call for a 25-megohm potentiometer, a very unusual size. Is this correct?

Dr. S. N. Neichin, Brooklyn, N. Y.

No. It should be 25,000 ohms. The author was tripped up by a confusing inconsistency that prevails in radio abbreviations for thousand. Seeing the pot labeled 25 M, he figured this was short for mega, the prefix for million. Actually, the M is the Roman numeral for thousand. But not all parts manufacturers use this. Some use K (or k) as an abbreviation for kilo, the prefix in the metric system for thousand.

Old Olds Climbed Mountains, Too

We who are interested in antique cars read Mr. Soule's article on George Green in the December issue [p. 129] with great interest.



Mr. Soule missed one very remarkable and interesting feature of Mr. Green's coast-to-coast trip in 1946. While in Denver, he made a side trip over the "highest automobile road in the world" to the summit of Mount Evans, altitude 14,259 feet, a short distance west of here. The car [a 1904 Oldsmobile] made the entire trip under its own power and without difficulty.

M. C. Snively, Weaver-Beatty Motor Co.
Denver, Colo.

Scooter Built from PS Plans

Here's my version of the $75 scooter in your issue of last July [p. 129].

I used a ¾-hp., 4-cycle Briggs and Stratton engine. Since this went directly on the frame, I had to move the brake drum to the left side of the rear wheel. The drive is by bicycle chain on 13- and 30-tooth

power-mower sprockets. I added a twist-grip throttle. The variable-ratio pulley works fine after some experimenting with idler spring tension.

I built the scooter as an introduction to power vehicles for my two boys, aged 13 and 17 years.

Willard Slay, Worthington, Ohio

Toe Brake Stubs PS Toe

In regard to your article "Toe-Pressure Brakes Stop New Packards," in your December issue, I would like to bring your attention to the diagram of operation on pages 108 and 109.

It is my belief that the check valve which connects into the vacuum line to the reserve tank is in the wrong place. In its present position, the brakes would not get any re-

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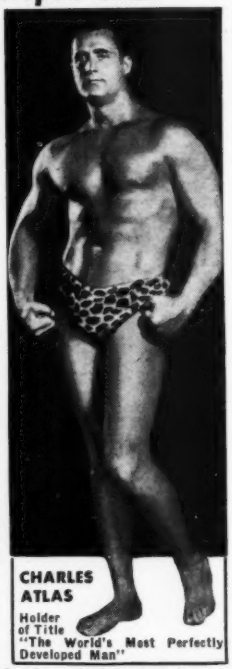

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serve vacuum if the engine was shut off. On the other hand, it would function correctly if the check valve were placed between the intake manifold and the "T" where the tank connects to the line . . .

SGT. THOMAS M. CHASE, Houston, Tex.

Have another look at the Packard power brake . . . I don't think your reserve vacuum tank is going to do you much good . . .

D. R. GLADISH, Cape Girardeau, Mo.

Page the man who drew the diagram of the Packard booster brake . . . and ask him what earthly good the reserve vacuum tank is going to do . . .

ROGER W. CADMAN, Williamsport, Pa.

Okay, okay. We admit it.

Thawing Pipes with a Welder

Your article on "How to Thaw Frozen Pipes" on page 234 of the December, 1951, issue was very instructive, but there are a few hazards that must be considered if an electric welder is used. Empty pipes in series with full water pipes will heat to a

dangerous temperature. Connections made with pipe dope may cause a high resistance and become red hot. A heavy current can destroy the lead gooseneck where the service line connects to the main. Be careful that gas lines do not form a parallel circuit with the water pipes. This could be dangerous.

LEON B. WARE, Glassboro, N. J.

Don't Burn Batteries

A letter and editorial comment in your January issue [p. 14] warns against burning worn-out flashlight batteries of the sealed type in a fireplace.

We believe you should tell your readers that, to be on the safe side, never burn *any* brand of used flashlight batteries in an open fire.

J. A. MCILNAY, Ray-O-Vac Co.
Madison, Wis.

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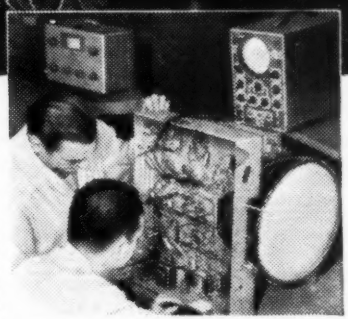

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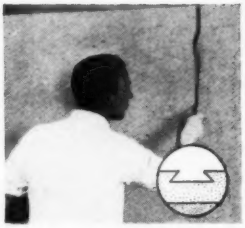
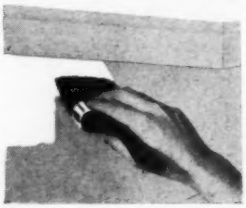


When replastering small areas, cut out all loose plaster. Leave indentation (see insert). Wet new edges with warm water before applying fresh plaster.



With the tip of brush, work paint up to molding. For best results use a nylon-bristled brush of the right size — one designed for the job.

Start painting in corner at molding. Work down to baseboard. Cover a space about two feet wide. Paint last strokes into area just painted to avoid overlap marks.

For overnight cleaning, pour thinner on brush. Work out paint on newspaper using stick or paint scraper to squeeze out paint. Suspend brush in thinner.

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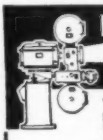

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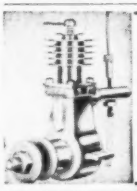

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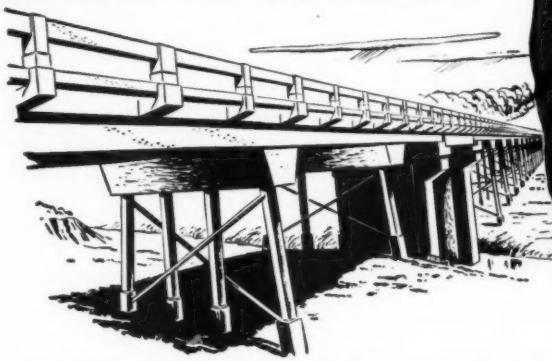

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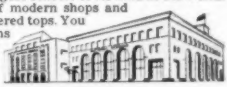

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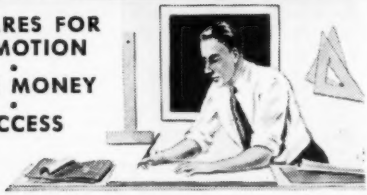

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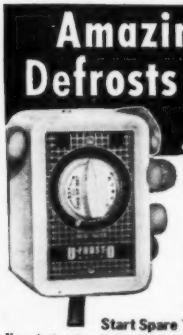

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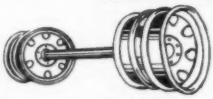

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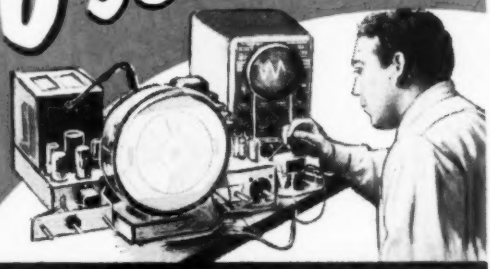

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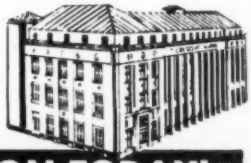

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750-16	7.94	710-15	6.34	32x6(8)	10.54	1000-22	17.54
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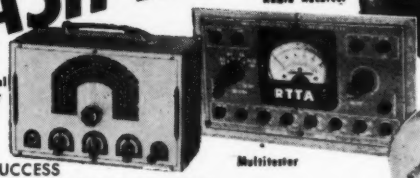

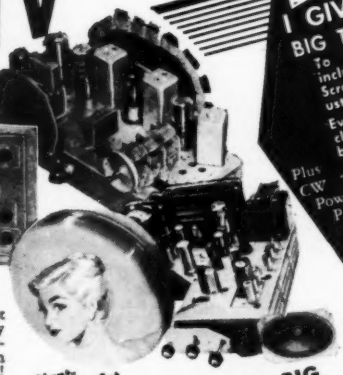

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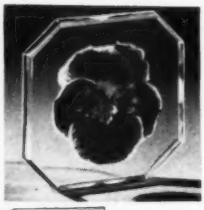

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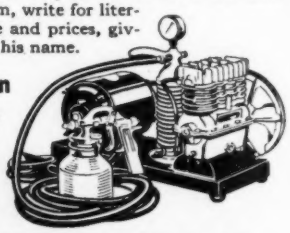

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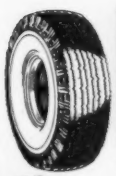

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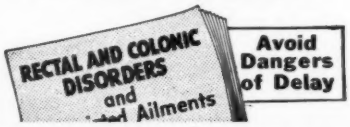

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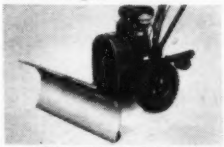

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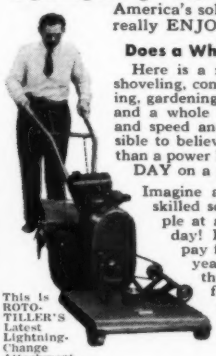

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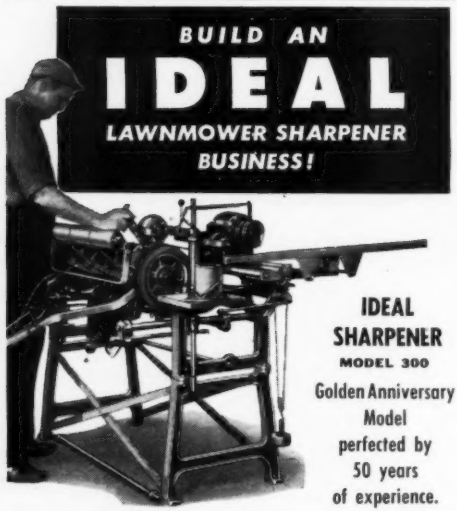

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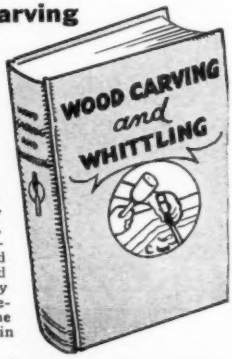

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Hundreds now paying grocery bills by the Patterson plan

Chicago man adapts "Lend-Lease" Plan to give men and women extra money for spare minutes or spare hours. Hundreds already making more than enough to pay grocery bills as Plan sweeps country.

IF YOU haven't already heard of the Patterson Plan, you soon will. The idea originated by L. B. Patterson of Chicago is permitting many families to laugh at the "high cost of living" by giving them an extra $50.00 to $60.00 a week just lending an amazing new attachment to friends and neighbors for free trial.

There is no mystery about the Patterson Plan. Any man or woman can use it. And you give to the Plan just as many minutes per day as you want to. There are no rules—no "duties" to perform—no required time to put in. There is nothing to study, no "course" to pay for, nothing to read or memorize. And you can quit using the Plan anytime you wish without losing a penny.

MAKING MONEY BY SHARING WITH OTHERS

Mr. Patterson is no dreamer. He is a hard-headed business man — a big money maker himself—who gets pleasure out of dealing with people. His business philosophy is summed up in the axiom, "He who shares, gains." And he has proved in a dramatic way that giving part of his profits to others to repay them for their help, actually makes more for his company!

You probably know many people who sell one thing or another as house-to-house salesmen. Direct selling is a very big business and several hundred thousand salesmen make good livings in this activity. But there are thousands and thousands of people who feel that they can't sell, or to whom it would be embarrassing to ask others to buy something from them. But with today's high prices on necessities many of these people need extra money coming in every week. It was to give them a money making method that Mr. Patterson worked out his plan.

30 MILLION WOMEN NEED IT!

He reasoned this way: A product that is really needed and wanted by millions of people does not have to be "sold." If it performs a valuable service and if people can prove to themselves without risking any money that it *does* perform this service, it will sell itself. It happens that he has such a product.

Among the many products handled by Mr. Patterson's company is one that is needed by almost 30 million women. Every woman living today who has one of the pre-war refrigerators would just "love" to have one of the new modern refrigerators that have the automatic defrosting feature.

Most women hate the messy, tiresome job of defrosting. In summer when the air is moist, many refrigerators have to be defrosted two or three times a week. Because if the frost is allowed to accumulate, it cuts down the efficiency of the refrigerator. It makes the motor run oftener and longer. It causes more wear on all the moving parts. It uses up more electricity—and, worst of all, it allows food to spoil because the heavy frost on the coils makes it almost impossible to keep the temperature of the box cold enough to prevent the growth of food bacteria.

The big refrigerator companies recognize this, too. They want the users of their pre-war boxes to be satisfied. That is why—when the Magic Defroster was invented—big companies like General Electric tested it in their laboratories and then approved it for use with their refrigerators.

A TREMENDOUS NATIONAL SUCCESS

This Magic Defroster is one of Mr. Patterson's biggest sales successes. It is a simple little attachment that plugs into the electric outlet. Then the cord to the refrigerator plugs into the side of the attachment. That's all there is to it. No installation. No wires to splice or solder. No drilling, no need even to move the refrigerator. Just plug in the Magic Defroster.

From that time on the Magic Defroster defrosts the refrigerator EVERY NIGHT between bedtime and early morning. And it operates so scientifically that the temperature of the box drops below the "keeping" point for only a few minutes. Even frozen foods stored in the ice cube compartment don't get a chance to thaw out. Yet the coils are clean every morning, the efficiency of the box increased, its life increased, the use of electrical current cut often as much as half. And the housewife is freed forever from the messy job of defrosting.

MAKING MONEY BY LENDING

Mr. Patterson reasoned that the only "selling" necessary was to allow women to see for themselves what the Magic Defroster would do for them. He knew that once it was in use, women would not want to part with it. So it was then that he developed his plan for lending it free of charge for a 10 day trial.

Obviously he couldn't send out thousands and thousands of Defrosters to people he never heard of. The free trial distribution would have to be made by responsible men and women and in every neighborhood — people who knew the families where the attachment was being left and people who would be responsible for calling back after 10 days and picking up the money after the Magic had sold itself to the housewife.

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The Plan has worked as magically as the Magic Defroster itself. And now, with the big season coming on, Mr. Patterson has decided to appoint several thousand more men and women in every city and village in America to operate the Patterson Plan—lend Defrosters—pick up the money—and share in the profits. If you would like to use some of your spare time in this way, with a chance to make as high as $60.00 a week, write to Mr. Patterson. He will send you complete details of his Plan free of charge. Then—after reading—you can decide whether you want to go ahead. Address him, L. B. Patterson, Maxilume Co., 125 W. Hubbard St., Suite D-9-C, Chicago 10, Illinois.

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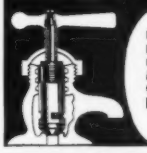

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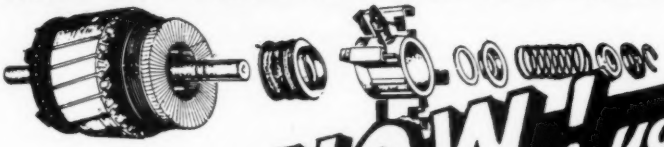

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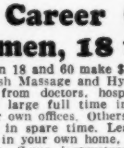

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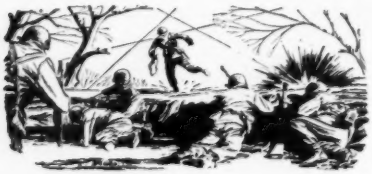

Captain Harvey advanced *alone* through a hail of enemy bullets. One by one, he personally wiped out four emplacements of machine guns and automatic weapons. Then he caught a bullet through the lung. But he stayed on, refusing evacuation, until sure the objective had been won.

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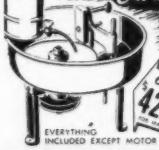

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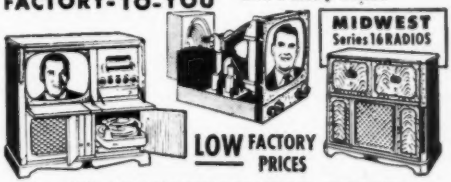

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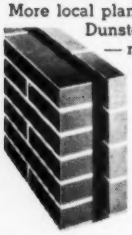

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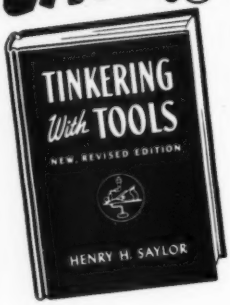

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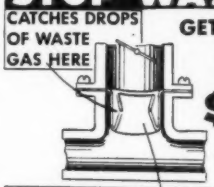

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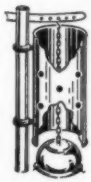

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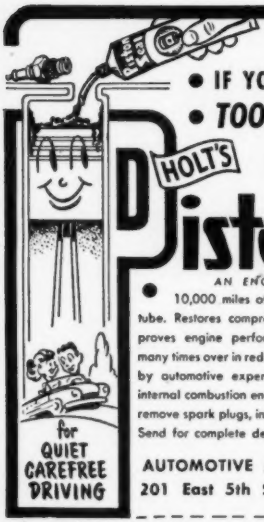

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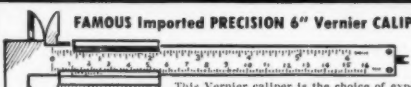

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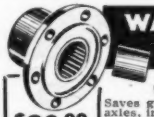

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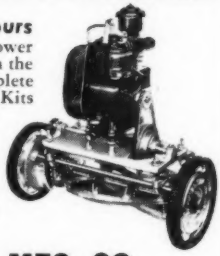

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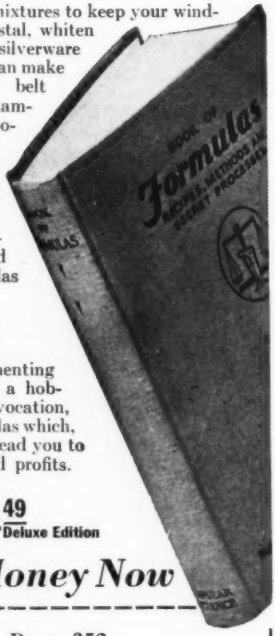

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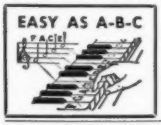

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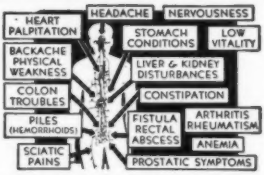

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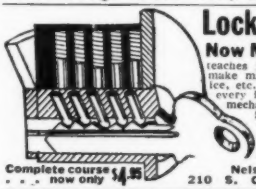

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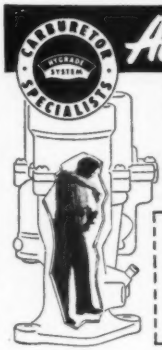

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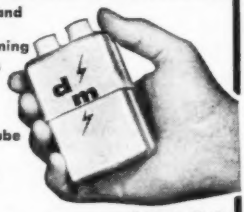

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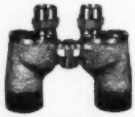

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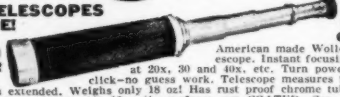

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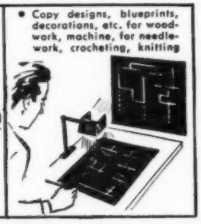

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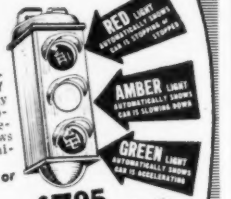

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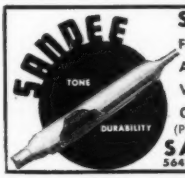

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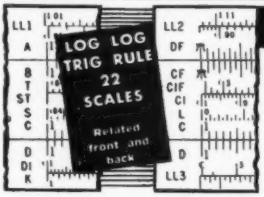

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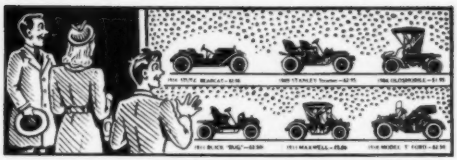

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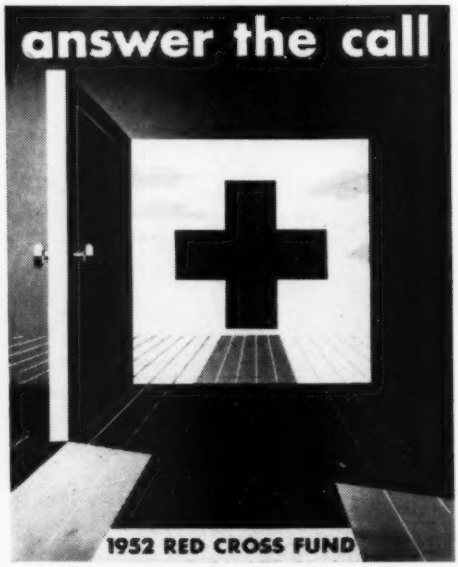

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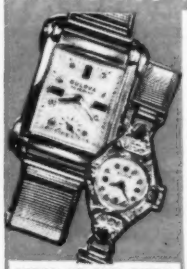

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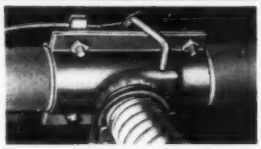

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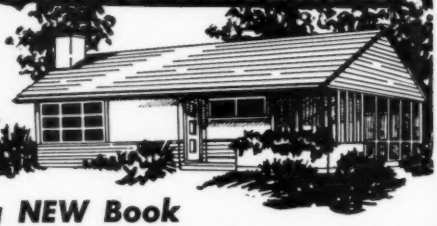

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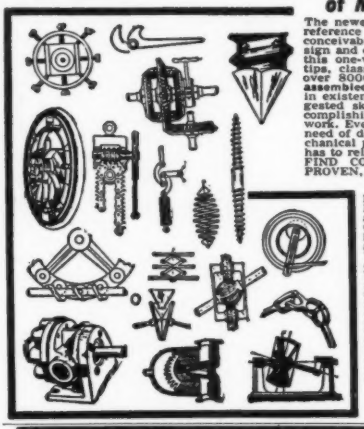

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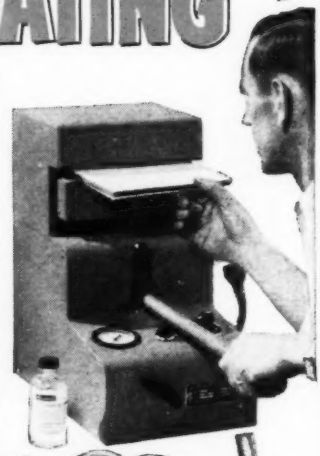

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START a profitable Lettershop on a shoestring! Sales $35,000 year. Started $36.00. Information free. Merritt Wells, Box 13, Basking Ridge 2, New Jersey.

MAKE Rubber Stamps, repair dolls, learn invisible reweaving, repair sewing machines. Catalogue of "40 Ideas." Universal, Box 1076-B, Peoria, Ill.

EARN Money At Home With Your Typewriter! Spare time! Details free. Edwards, Publisher, 3915-PS, 12th, Des Moines 13, Ia.

FIGURINES unpainted, free illustrated list. Haverty Products, 822-A 17th Street, Altoona, Penna.

SENSATIONAL Imported Snapping Alligator novelty tremendous 15c seller. 2 samples mail 2 dimes. Unger, 655 South Wells, Chicago 7.

MAIL Selling opportunities galore! Free! Wehner, Box 142-E-2, Roxbury 19, Mass.

HOME Mail Business supplies. Lists Free. Lincoln, Box 449, Irwin 3, Penna.

ADDRESS Envelopes, Postals, at home—longhand, typewriter. Information, 3c stamp. Carl E. Torrey, Melrose 76, Mass.

MAILING postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordon Publishers, Box 23, Pawtucket, R. I.

"HOW To Build Financial Independence!" $1.00 postpaid. R. D. Harrison, Box 247, Dermott, Arkansas.

HOME workers earn $3.50 to $7.00 per hour addressing envelopes at home using a portable Weber Addressing Machine. Start in business for yourself for as little as $20.00. For full particulars write Weber Addressing Machine Co., Dept. P-S, Mount Prospect, Illinois.

HIGH-Class Mail order business. No schemes. No junk. Sell own products. Dignified profits through proof-tested systems. Information and "Quizogram"—Free! Opportunity Listing Service, Liberty 1, Texas.

CASH Income from your backyard! Unusual Businesses! Pikett's, Florence, Ky.

$46 FROM Square Foot Plywood; Jigsaw necessary. Write: Woodart, Bridgewater, Massachusetts.

MAKE Money At Home—Mailing literature featuring fast-selling books—merchandise. Everything furnished. Information Free. Hickory Lane, East Kingston 2, New Hampshire.

CARNIVAL Rides from Auto Parts. Plan Catalog 25c. Box 875-S, Peoria, Illinois.

24 PAGE Directory of mail dealers and supply sources with postal law digest 25c. Sponsler, Box 805, Beverly Hills 20, Calif.

WHY Job Worry? Start Electroplating, Metal Finishing Business. Free Information, trade secrets. Plater S. Hyde, 327 West 120th Street, Los Angeles 61, Calif.

BUY it wholesale. Manufacturers, Distributors. Over 850,000 items. Literature free. Olsen, 1231-B East Third St., Duluth 5, Minnesota.

TIN Cans, Jars, Bottles. Turn them into cash. 25 methods. Instructions 50c. G. Turk, 169 Behnke Avenue, Paramus, N. J.

SELL By Radio, pay on orders received. No risk. Complete procedure and list of 400 stations $1.00. H. Rosenberg, 962 Aldus St., New York City.

38 MONEYMAKING OPPORTUNITIES

BE Appointed State Notary Public Now! Details: Stationers, Helotes, Texas.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner, P-125 West 86th, N. Y. 24.

SCHOOL Seniors—Earn sensational profits selling classmates America's Most Beautiful Graduation Name Cards. Largest selection. Outsells all others. Free sample kit. Printcraft, Dept. P, 1425 E. Elm Street, Scranton 5, Penna.

$10,800 PROFITS At Home! Lifetime Opportunity! Free advertising method builds your own Home Mailorder Business! Capital, experience unnecessary. Start spare time. No merchandise investment! No advertising risk! Exciting; practical. Copyrighted, notarized proven successful plan 25c. Satisfaction guaranteed! Treasury, 149 Storer, New Rochelle 6-P, New York.

PRINT Without A Printing Press. Big Money! See page 59.

POPULAR SCIENCE OPPORTUNITIES

WIN contest money. General Contest Bulletin gives hundreds of tips. List current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

$4 TO $10 Hour Spare Time, billion-dollar Adjusting field. Free Book—Now! Universal Schools, P-125, Box 8202, Dallas 5, Texas.

MAKE Money addressing Envelopes at Home! Our information reveals how. Only 30c. Business Bureau, Dept. 45-C, P. O. Box 2224, St. Louis, Mo.

$35.00 WEEKLY! Possible! Home! Spare time! 27 unusual projects! Literature free. Walsh, 894 Main, Buffalo 2, New York.

21 POPCORN, Candy Apple Formulas, proven money-makers. Send $1 today for formulas, catalog of money-making ideas. Concession Supply, 3916 Secor, Toledo, O.

EARN Money Evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 2, Wisconsin.

MAKE $300 weekly! I did. Install TV antennas. Instructions $1. TV, 708 Florence, Joliet, Illinois.

BUILD inexpensive professional Geiger counters. Plans $1.00. W. Palmer, 200 W. 58th St., New York 13, New York.

FREE Book "505 Odd, Successful Businesses" Work Home! Expect something Odd! Pacific-35C, Oceanside, Calif.

UNPAINTED Plaques, Bookends, Novelties. Stamp brings list. Umlauf, 239 So. Luther, Detroit 25, Michigan.

$100-$200 WEEKENDS. No selling or manufacturing. Mahaffey, 3032-A Weldon, Los Angeles 65.

MAIL Order Opportunities—Send 25c for magazines, "Progressive Mail Trade" and "Tip Top Salesman," plus our latest wholesale catalog of toys, novelties, etc. J. Gerlach, Box 245, Sheboygan, Wisc.

SPARTETIME Profits Taking Subscriptions All Magazines. Wholesale Catalog Free. Cassell Publishers, Westfield 1, N. J.

WE pay you highest rates for hand-decorating greeting cards. Work home. Experience unnecessary. No selling required. Greetings, 100 Madison, Detroit 26.

WATCHES, Elgin, Waltham, Other Outstanding brands. Expertly reconditioned, priced low for quick, great profits! Send for Free catalog. Plymouth Jewelry, 163-P Canal St., New York 13, New York.

$$$ IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro, Oakland 6-P, Calif.

EARN extra money! Sell novel folding globe. Nothing like it! Sample only 50c. Fold-O-Globe, 2501-M N. Ontario, Burbank, California.

39 FORMULAS, PLANS, ETC.

LATEST manufacturing formulas, for profitable, easy to make chemical specialties. Lists free. Automotive Chemical Laboratories, Box 393-B, Hicksville, N. Y.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

FREE Formula Catalog anything analyzed $25.00. Western Chemical, Salem, Oregon.

HOT Tamale making for Profit. Particulars write. F. E. Skinner, 419 W. Live Oak, Altus, Oklahoma.

FREE lists. Formulas sent on approval. Kelly, 9544 Whitcomb, Detroit 27, Mich.

LABORATORY tested formulas. Lists free. Pont, Box 635-PS, Terre Haute, Ind.

ANY Formula $2.00. Satisfaction guaranteed. Jack, Chemist, 4292 Parkside, Philadelphia.

40 PLASTICS

LEARN Plastics at home. Small cost—Spare time. Dime brings sample plastic, three experiments, full details. Plastic Projects, Box 5151, Detroit 35, Mich.

LUCITE, Plexiglas. Any size sheets masked Square foot (12 x 12) cost 1/16" $1.20; ⅛" $1.40; 3/16" $1.75; ¼" $2.08. Include 10% postage. Almac Plastics, 230 Fifth Avenue, New York 1, New York.

IT'S fun! It's easy! It pays! Write Plasti-Kit, Box 457, Algonac, Michigan.

NEW liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Wholesale Catalog and New Sales Manual showing how to make money at home. Castolite, Dept. C-102, Woodstock, Illinois.

PLASTIC Sheets, Rods, Tubes, etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

MANUFACTURERS of a complete line of internal carvings. Crystal Floral Company, Bound Brook, New Jersey.

PLASTIC Sheets, low prices. Instruction Manual, complete catalog, 50c postpaid. Plastic's, Box 1812, Salt Lake City 10, Utah.

PLASTIC: sheets, rods, tubing: Lucite, Acetate, send $1.50 for 4 pound assortment and instruction manual. Regal Plastic Supply, 720 Main, Kansas City 6, Missouri.

PLASTICRAFTERS supplies wholesale. Literature 20c. Cosmopolitan, Box 176-PS, New York 8, N. Y.

41 CHEMICALS & APPARATUS

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

NEW Idea Chemical and Apparatus Outfits for Home Experimenting. Photo-Scales, Microscopes, Chemicals, Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York 11, N. Y.

LABORATORY Apparatus, Chemicals, Microscopes, Complete Chemistry Sets, Minerals, Uranium Ore, 10c brings catalog. Porter Chemical Company, Hagerstown 2, Maryland.

SPECTROSCOPE for quick chemical analysis $3.00. Book 200 electric stunts $1.00. Cutting Sons, Los Altos, Calif.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 20c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

SAVE Money! Supplies Catalog 15c, refundable. Laboratory Sales, Box 161-B, Brighton, Mass.

42 HELP WANTED

CONSTRUCTION Job List. Published Monthly. $1.00. Dempster's Construction Scout News, Dept. 268-DH, Bridgeport, Ill.

ALASKA—Last American Frontier. $1.00 brings 1952 Business Directory, Government Map, Construction Projects Military & Civilian, Homestead & Highway facts, Hunting-Fishing-Game Rules, Mining, Aviation, List of firms hiring, How-When-Where to apply. Alaska Opportunist, P. O. Box 883-S, Hollywood 28, California.

FOREIGN & Latin American Employment 1952 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring. $1.00 post-paid. Global Reports, P.O. Box 883-S, Hollywood 28, Calif.

FOREIGN Jobs. Contracts underway and soon starting in Africa, South America, Canada, England, Europe, South Pacific, Middle East, Mexico and Alaska. Send $1.00 for foreign job news, information, application forms, etc. DCS Foreign Job News, Dept. 268-DJ, Bridgeport, Ill.

$1,000,000 CONSTRUCTION Projects, "World Wide" printed Monthly Foreign & Domestic employment. Free application blanks tells How-When-Where to apply. $1.00 complete. Global Reports, P.O. Box 883-PX, Hollywood 28, California.

FOREIGN Employment Construction men, building trades, helpers, office men, others, interested in Foreign Projects. High wages, quarters, transportation. Send $1 for Foreign Construction Compendium and Application Forms. Foreign Service Bureau, Dept. PS-3, Metuchen, New Jersey. (Not an employment Agency—no fees.)

HONOLULU Help Wanted columns airmailed $1.00. Pomeroy's, #3 Campbell Block, Honolulu, Hawaii.

43 AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 18, Chicago 4, Illinois.

NEED Extra Cash? Take orders for personal initialed belts and buckles, cap badges, tie holders, etc. Choice of 3000 emblems. Free sales kit. Hook-Fast, Dept. 1425PS, Providence, R. I.

SCHOOL Seniors! A postal will bring you our wonder, Kwick-Sell Cardalog of popular Graduation Name Cards. Biggest profits! Only firm giving free Golden Memory Book and Souvenir Chest. Don't miss out. Hurry that postal! Craftcards, Box 235 (m), Pittsburgh 30, Pa.

START Your Own Business on credit. Always your own boss. 1,437 Dealers sold $5,000 to $28,500 in 1950; their average $6,704. We supply stocks, equipment on credit, 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. C-U-PSC, Freeport, Ill.

NEED Money $50-$100 and more is yours—easily, pleasantly, quickly. In spare time just show friends irresistible Elmira assortments of all-occasion greeting cards, wrappings, personalized stationery, napkins, matches, many other exclusive, profitable specialties. No investment. No experience. Success assured. Bonus. Special Prizes. Promptest Service. Write Today. Free samples, assortments on approval. Elmira Greeting Card Co., Elmira 115, N.Y.

ANYONE can sell Hoover DuPont Nylon Uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. C-101, New York 11, N. Y.

WHERE to Buy 800,000 articles direct from Manufacturers. Save by buying direct. Sent Free. "Your Profits Under The Spotlight." Glass Pub. Co., Ellwood City 4, Pennsylvania.

SELL Sunshine Exclusive Everyday Cards and make Big Money the easy friendly Sunshine way. Complete selection greeting cards, stationery, gift wraps, novelties, etc. 21 DeLuxe Miniature Everyday cards —75c. Many others. Send postcard today for your Sunshine Sample Kit on approval to: Sunshine Art Studios, Dept. PS-3, 115 Fulton St., New York 38, New York.

NEW "Sponge" Wall Cleaner. Erases dirt like magic. Wallpaper, painted walls, ceilings. Saves redecorating. Lightning seller. Samples sent on trial. Kristee 144, Akron, Ohio.

AT Last! Something New and Sensational in Everyday Cards. 21 for $1. Make Extra Money Fast! Show Satin, Velour, Metallic Cards. Get orders easy. Big line $1 Assortments, Scented Stationery, Personal Matches, Kiddie Books, Imprints Free. Two $1 boxes On Approval. Puro Co., 2801 Locust, Dept. 241-C, St. Louis 3, Mo.

MAKE Money Calling On Friends. Show nationally advertised Greeting Cards—new All-Occasion Assortment and laugh-packed Barrel-of-Fun. Also sensational Pinafores & Parasols Personal Notes. All three dollar sellers. Up to 50c profit for you. Big line includes Gift Wrappings, Stationery, Gift Items, etc. Get Three assortments on approval. Write Wallace Brown, 225 Fifth Ave., Dept. J-4, New York 10.

MAKE Money Fast—Sell big value Greeting Cards. Four new 21 card $1.00 All-Occasion Assortments, Birthday, Easter, Novelty cards, Gift Wrappings, Stationery, Notes. Unusual Gift Items. Over 100 fast-sellers. Amazing profits. Write for Samples on Approval and "Get-Started" Plan. Hedenkamp, 361 Broadway, Dept. PS-16, New York.

POPULAR SCIENCE OPPORTUNITIES

BARGAINS—Terrific Savings—Job Lots—Close-outs! Also save up to 50% on complete lines of Drygoods, Clothing, Hosiery, Notions, Drug Sundries, Toiletries, Novelties, Gifts, Jewelry, Television, etc. 2000 items. Send 25c for Illustrated Wholesale Bargain Catalog, Close-out Flyers, and Special "Get-Acquainted" offer. Valuable merchandise certificate (worth many times 25c) included Free. Reliable Jobbers, 311-J North Desplaines, Chicago 6.

MAKE Wedding Profits. Sell invitations, napkins, matches. Samples free. Dunbar's, Middlebush 5, N. J.

WANT to make real money? You can positively make $50.00 a day and up selling a brand new item going to every type of Food and Beverage Store, Factories, Laboratories, Hospitals, etc. First time advertised. Samples furnished. Utility Durawear, 53 West Jackson Blvd., Dept. PS-03, Chicago 4, Illinois.

MAGIC words give you daily cash! "Kendex nylons are free unless satisfactory". New style 300 only 98c including your commission, bonus and postage. If these wonderful sheer DuPont nylon stockings run, snag or are not satisfactory within 1½ months of receipt, we refund the full 98c so they will cost nothing! What woman will hesitate to wear fine nylons at our risk? Just write orders. We deliver and collect. Advance cash plus huge bonus. Spare or full time. No experience necessary. Postcard brings you sample stocking and money-making outfit free and prepaid. No obligation. Kendex Corporation, Babylon 64, N. Y.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 6770, Cincinnati 25, Ohio.

GOLD Lacquered and Silver Sign Letters. Windows. Doors. Trucks. Standard sizes. Penny each. Free samples. Atlas-G, 544 West 79th, Chicago 20.

DO You Need Money? $40.00 is yours for selling only 50 boxes of our 300 Greeting Card line. And this can be done in a single day. Free samples. Other leading boxes on approval. Many surprise items. Experience unnecessary. Free samples Personalized Stationery, Napkins. Write today. It costs you nothing to try. Cheerful Card Co., 506 White Plains, New York.

BUY wholesale 25,000 items, catalogue 25c. Matthews, 1472-A8, Broadway, N.Y.C.

STRANGE "Dry" Window Cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 145, Akron, Ohio.

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 437 N. Clark, Chicago.

AMAZING discovery. Master Glaze puts brilliant glass-like surface on cars. Free sample, information. Big commissions. Master Glaze, Dept. 737, 7720 Harwood, Milwaukee, Wisconsin.

BE A Money Maker . . . Use your home as magazine headquarters. Liberal commissions. No experience—No capital needed. Everything furnished. Write for Free Catalog. McGregor Magazine Agency, Dept. 510A, Mount Morris, Illinois.

$100.00 WEEKLY selling, installing door and window guards—Hotels apartments—Homes. Write, Henry Ernst Mfg., Wilmette, Illinois.

PHOTO-Salesmen-Agents. Sell beautiful hand colored plastic enlargements and sensational new photo compacts, rings, bracelets, lockets, etc. Collect deposit, we deliver. Profitable sideline. Send card for Free sample kit. Novel Portrait Co., 3343-A North Ave., Chicago, Ill.

FREE Samples, and amazing plan giving you gorgeous Dress without penny cost. Rush name today, with dress size. Harford, Dept. G-435, Cincinnati 25, Ohio.

FAST sellers. Big demand. Catalog. Parker Drug Co., Hoboken 6, New Jersey.

EARN Big Money Fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. 543, Rochester, Indiana.

MAN to earn $90 week up. Long needed invention. Advertised Saturday Evening Post. Colliers. Prospects everywhere. Full or part time. Exclusive. No investment. Free samples. Write Red Comet, Inc., Dept. 30-B, Littleton, Colorado.

SELL new clothing. Lowest prices. Operate from home, auto store. Enormous profits. Big catalog Free. S&N, 605-D 12th Place, Chicago 7.

ALL-Occasion Greeting Cards that are such terrific sellers all you have to do is show them. 21 boxed sell for $1.00. Over 100 other wonderful boxes including Birthday, Get-Well, etc. Profits to 100% plus bonus. Write for free samples. Kit on approval. Regal Greeting Card Co., Dept. 139, Ferndale, Michigan.

PRINTING — Salesbooks — Envelopes — Tags. Free Illustrated Catalog — Ersco, Bronx 72, New York.

BIG profits selling ties. ($2.00 values) $6.50 dozen. Free catalog. Empire Cravats, 648A Broadway, New York 12.

MAKE money like magic. Commissions, bonus to $5.00 pair. Sensational exclusive cushioned shoes, dress, sport, work. Paratroops, Cordovans, Bolo, Swank. No experience or investment. Free outfit. Samples. Paragon Shoes, 713 Columbus, Boston.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog free. Pickcraft, C-19 Bank, Attleboro, Massachusetts.

HOTTEST 39c item on the market. National Sales And Service, Greenville, Pa.

CALIFORNIA sweet smelling beads, sensational sellers. Particulars free. Mission, 2328P West Pico, Los Angeles 6, Calif.

ADDRESS Envelopes! Immediate Commissions! Starting Outfits, 25c! Hirsch, Spring Valley 3, New York.

PART Time Salespeople—Men and Women. Daily Cash returns showing Artmoore Products, three "in demand" items. No investment in stock. Liberal No Risk Starting Offer. Write Dept. C-3, Artmoore, 1319 North Third, Milwaukee, Wis.

BIG Profits In Spare Time! I'll send Free Assortment Full-Size Samples fine Foods, Household Necessities to ambitious Men-Women who need money, Friends, neighbors buy eagerly. Send no money. Just write Blair, Dept. 55HC, Lynchburg, Va.

AGENTS outside New York State: private label. Home products, selling aids. Jack Love, 265 Huntington, Buffalo 14, N. Y.

SELL Big Money-Maker to Men and Women. Easy handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Mass.

MEXICAN feather pictures. Sell on sight; 200% profit! Free details; sample 10c stamps. Sylvia-SV, Apartado 9036, Mexico City.

POWER Lawn Mower—$45.00. Prepaid. Sensation. Exclusive deal. Rotacut-RP, Excelsior Springs, Missouri.

MAKE big money—season starting—sell 1953 calendars, advertising specialties and executive gift line. Experience unnecessary. Commissions advanced. Outfit Free. North American Calendar, 605-AB Washington, Chicago 6.

FREE book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-38C, Oceanside, Calif.

STOP oil pumping! Restore compression! 200,000 mile guarantee! Only $3.00. Nerlind, Box 7, Inglewood, Calif.

BILLFOLDS for men, women. Handsome plastic styling. $5.00 dozen postpaid. Boxed $5.50. Samples 2 for $1.00. Crescent Sales, 150-A Broadway, New York City.

BUY Wholesale thousands nationally advertised products at big discount. Sent free "The Wholesale Plan." American Buyers' Service, 629-S Linden, Buffalo, N. Y.

SELL $2 Fire Extinguishers. Locally, mailorder. Lorrac Products Albany 1, N.Y.

SCHOOL Seniors! Agents wanted for dance charts in color, with patented holder. Sell schools, stores. Free samples. Trans World Novelties, 2425—231 Street, Torrance, Calif.

NICKEL Silver key checks—Key check stamping Outfits. Catalog free. General Products, 11PS, No. Pearl, Albany, N. Y.

NEW Footwear Sensation! Hundreds extra dollars for you! Sell Flexiclogs, new, patented hinged wooden sandals that actually "Flex" with your foot. Interchangeable straps. Neoprene crepe soles. Friends, neighbors buy on sight. Send for Free Sample Outfit now! Flexiclogs, Box PS-3, New Holstein, Wisconsin.

44 HIGH-GRADE SALESMEN

MAKE Money with fast-selling Bostonian Shirts, Blouses too. Spare time, full time. Sales Kit Free. Bostonian, 89 Bickford, Dept. M-11, Boston 30, Mass.

WRITE 3 Words—Collect $7.65 on 10-second Demonstration to merchants—write on glass with Amazing Magic Crayon—Presto!—5-color advertising message takes fire—glows like brilliant Neon. Three sales daily bring $22.95 profit. Rush postcard for details.—Complete Sales Kit Free! Maxilume Co., 125 W. Hubbard, Dept. CL-9-C, Chicago 10, Illinois.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. P-352, 7530 Greenwood, Chicago.

SUCCESS Opportunity — Sell famous Spring-Step Shoes. Earn up to $25 daily plus cash and shoe bonus. Write PS-3, Ortho-Vent Shoe Co., Salem, Virginia.

BIG money fast. Sell printing, office supplies, advertising specialties. Experience unnecessary. Every business buys. Lowest prices. Full—part time. 1,000 products. Permanent. Samples Free. Kaeser-Blair, Dept. 35, Cincinnati, Ohio.

AD Matches! Sell Amazing Designs—20, 30, 40 and 240-light book matches. Biggest spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy Nothing! Sales kit furnished. Match Corp., Dept. PS-27, Chicago 32, Illinois.

AMBITIOUS Married Man Travel U. S. With Wife, training for fascinating career in radio advertising . . . Executive position, non-travel available after 18 months. Salary plus commission start. Highly profitable. No Experience Necessary. We Will Train friendly outstanding, young, career man with good car. Wife must type, drive and assist first 18 months. Lifetime opportunity with successful firm. Write immediately. National Radio, West Hempstead, New York.

45 EDUCATIONAL & INSTRUCTION

BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dollar-A-Week" Bookkeeping and Tax Service. Full or spare time. Details Free. No obligation. Ellis, Box 203-C, Cedar Grove, N.C.

PIANO Tuning Pays. Learn this profitable profession at home. Our Tonometer and mechanical aids make learning easy. No knowledge music necessary. Diploma granted. Largest and oldest school—51st year. G. I. Approved. Write for booklet. Niles Bryant School, 77 Bryant Bldg., Washington 16, D. C.

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USED Correspondence Courses and Books sold and rented. Money back guarantee. Catalog free. (Courses Bought.) Lee Mountain, Pisgah, Alabama.

POPULAR SCIENCE OPPORTUNITIES

START a Collection Agency business. Very profitable. Quickly learned. Write Cole & Associates, Syracuse 2, N. Y.

BECOME a Doctor of Psychology or Metaphysics. Teach secret of contentment, happiness. Win degree of PsD, or MsD. Solve mental worries. Free book. College of Universal Truth, 5153-K N. Clark, Chicago.

MEDICAL Laboratory Technicians in great demand. We train you in your own home. Catalogue free. Imperial Technical Institute, Box 973-B, Austin, Texas.

WORK For U. S. Gov't! Start high as $73.00 week. Men—Women. 95,000 jobs open each month. Experience usually unnecessary. Qualify Now! Write for Free 32-page book showing jobs, salaries, sample tests. Franklin Institute, Dept. G-22, Rochester, New York.

HIGH School—No Classes. Study at home. Spare time. Diploma awarded. Write for Free catalog. HBA-10 Wayne School, 2527 N. Sheffield, Chicago 14, Ill.

USED Correspondence courses bought and sold. Literature free. Walsh, 894 Main, Buffalo 2, New York.

SUCCESS Anonymous. Start Local Club. Social, Educational, Fraternal. Write: Ben Martin, Williamsburg, Michigan.

BARTENDING-School or Home Training. American Bartending School, P-334 S. Wabash, Chicago 4, Illinois.

STAMMERING, permanent cure $1.00. J. Allen, Box 114, Saskatoon, Sask., Can.

WELDING training pays at Hobart Welding School. Box P-322, Troy, Ohio. VA Contract. Best equipment. Catalog Free.

AMAZE your friends, learn to make Magic Squares, $1.00. S. Martin, 3755 N. 55 St., Milwaukee 16, Wisconsin.

STUDY for game warden, park, forestry and patrol service. Write Delmar Institute, D16, Whittier, Calif.

USED Correspondence Courses and Educational Books Bought, Sold, Rented. Catalog Free. Educational Exchange, Summerville, Georgia.

MINERALOGY course, $5.00. Western School Of Mineralogy And Mining Inc., Box 1130, Long Beach, Calif. Inquiries Appreciated.

NOW . . . A college education by home study. State Chartered. Fremont College, Santa Fe 3, New Mexico.

LEARN Brush Lettering. Easy Method anyone can learn. Profitable. Alphabets included Free. Send $1.00. Satisfaction Guaranteed. Midwest Art School, Fort Wayne 2, Indiana.

RADIO, Electricity, Elementary and higher mathematics. Individualized Instruction. New Correspondence School, Box 27, Brooklyn 13, New York.

BOOKKEEPERS earn $100.00 weekly operating simplified Bookkeeping-Tax Service. Details free. Universal, Box 664-P, Springfield, Missouri.

MIDLAND Linotype School, Charles City, Iowa. Civilian, Veteran courses. Free placement.

SUCCESSFUL Hypnotism explained. Complete, self-explanatory, surefire methods revealed. $1.00. Hypnotist, Room 786, 550 Fifth Avenue, New York City.

46 CONTESTS

TIE-Breaker picture puzzles exposed. $1.00. Winograd, Box 1495, Philadelphia 5, Penna.

$1000 WON by client. Contest Service, United, 13 Earl, Red Bank, N. J

HOW to construct unicorn tiebreakers. Solve one rebus. Win cash. Turlot, Box 1221, Chicago 90, Illinois.

47 DETECTIVES

DETECTIVE Training. Phillips Secret Service System, 1917-C North Kenneth, Chicago 39, Ill.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write, Wagoner, P-125 West 86th, New York 24.

DETECTIVES needed in every town. Hanna, 8118 Fielding, Tampa, Florida.

48 LANGUAGE OUTFITS

LISTEN. Learn A Language by Linguaphone. At Home, quickly, easily master Spanish, French, German, Russian, Chinese—any of 29 languages through Natural Linguaphone Conversational Method. Add to service, job, travel opportunities. Send for Free book. Approved for Veterans' Training. Linguaphone Institute, 5403-Radio City, N.Y.C.

50 BUSINESS SERVICE, INFORMATION, NAME LISTS

MAILING Lists. All kinds 1000 $5.00. Dixie Service, King, N. Carolina.

300 BIG Mails Guaranteed, samples, offers propositions, 12 months listing, $1.00. Wright Publications, 2276-M Hubbard, Memphis 8, Tennessee.

MAILING Lists 1,000, $5.00. Alex Palazzo, 32-07 70th Terrace, Jackson Heights, New York.

51 SPECIAL SERVICES

SURPRISE your Friends. Remail your letters 25c each. Welldoing, 1712½ Nebraska, Tampa 2, Florida.

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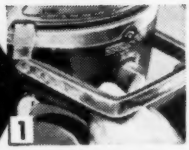

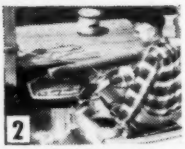

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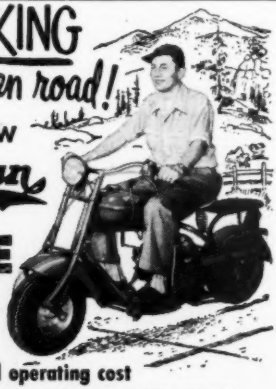

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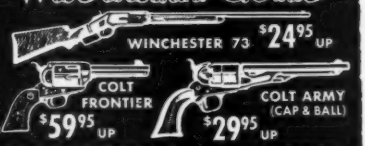

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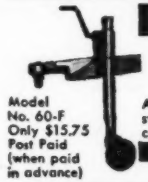

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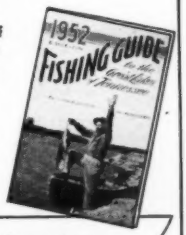

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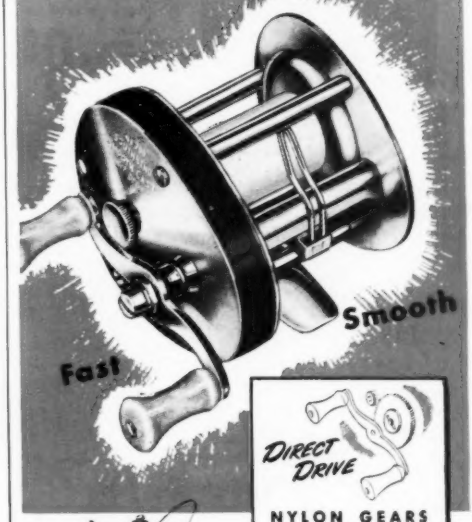

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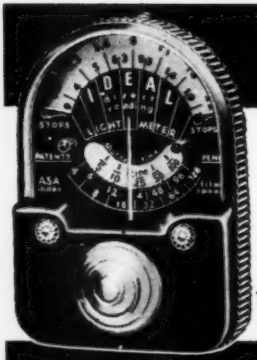

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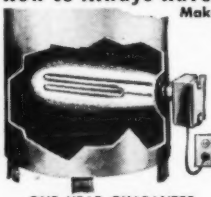

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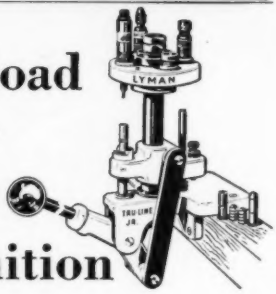

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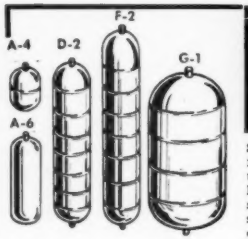

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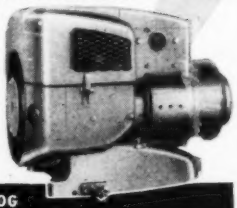

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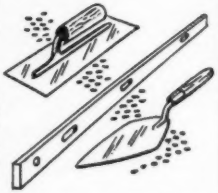

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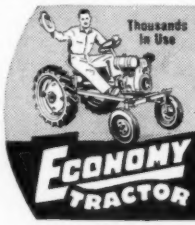

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Every day, you see more Mercurys! An impartial survey by a leading outdoor magazine shows that the demand for Mercury has increased far more than the demand for any other outboard:

Here's a mighty Mercury—the "Super 10" Hurricane — no other outboard in the 20 cubic inch class offers such a range of performance, from slowest troll to record-slashing racing speeds.

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Chrome wheel discs optional at extra cost—decorative and other specifications subject to change without notice.

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HERE it is—the exciting new Studebaker styling that is the talk of the entire nation.

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Stop in right away at a nearby Studebaker showroom and arrange to try out one of these eagerly responsive, amazingly thrifty Studebaker style stars.

Studebaker's the newest of the new for '52—a sprightly new Studebaker Champion in the lowest price field—a brilliant-performing new 120-horsepower Studebaker Commander V-8.

See Studebaker for '52

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Sparkling with eye appeal—the dramatically styled 1952 Studebaker Champion, or Commander V-8, four-door sedan.

POPULAR SCIENCE
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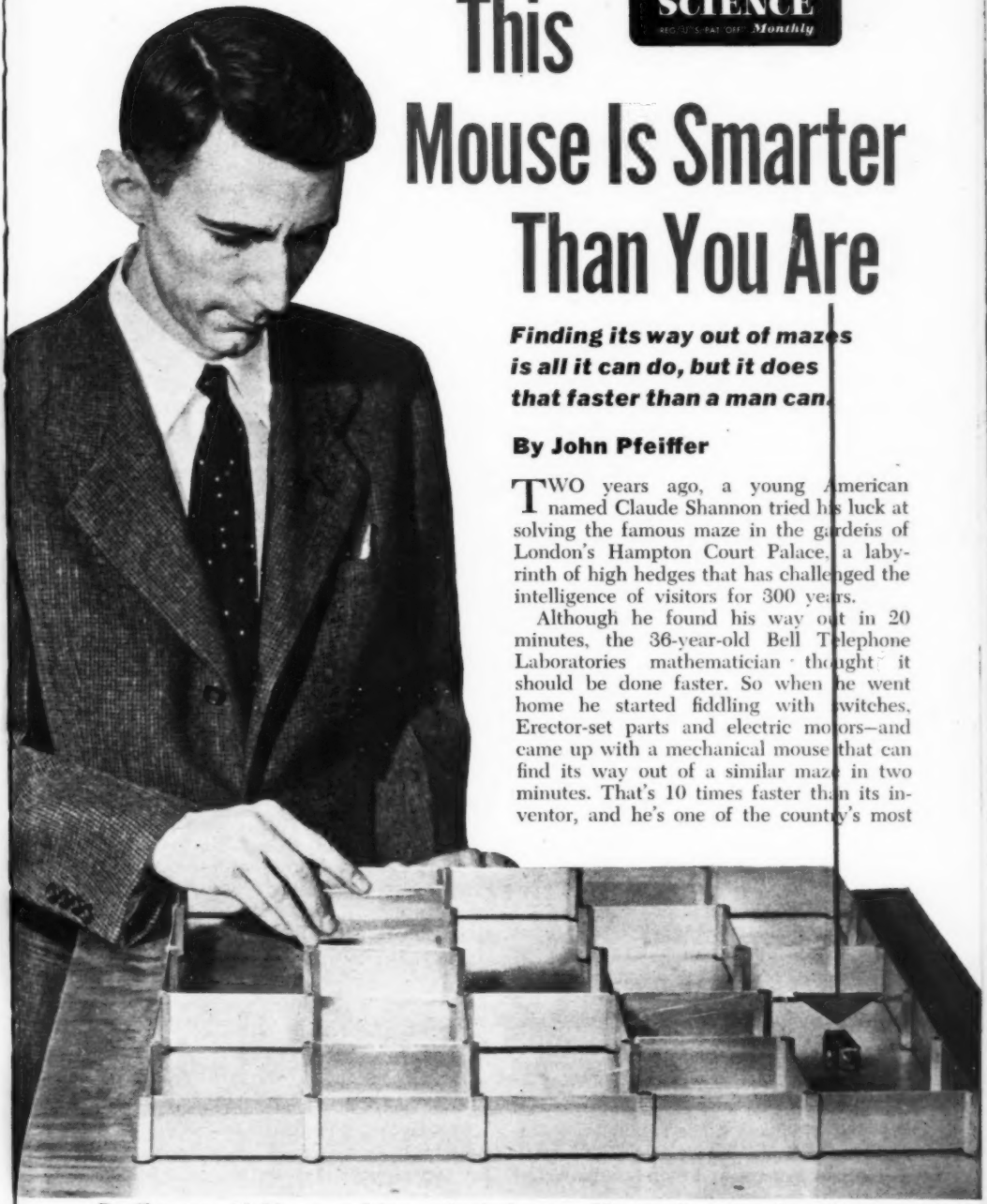
This Mouse Is Smarter Than You Are

Finding its way out of mazes is all it can do, but it does that faster than a man can.

By John Pfeiffer

TWO years ago, a young American named Claude Shannon tried his luck at solving the famous maze in the gardens of London's Hampton Court Palace, a labyrinth of high hedges that has challenged the intelligence of visitors for 300 years.

Although he found his way out in 20 minutes, the 36-year-old Bell Telephone Laboratories mathematician thought it should be done faster. So when he went home he started fiddling with switches, Erector-set parts and electric motors—and came up with a mechanical mouse that can find its way out of a similar maze in two minutes. That's 10 times faster than its inventor, and he's one of the country's most



Dr. Shannon with his maze-solving mechanical mouse. Maze can be arranged a million ways.

HIGH HEDGES make tourists twist and turn to get through London's Hampton Court maze, devised by King William III. Guide on stilts is nearby to rescue anybody who gets panicky.

brilliant mathematicians. Unfortunately, maze-solving is all the mouse can do.

I have seen this man-made mouse perform. It is a two-inch bar-magnet "tricycle"—one wheel in front, two in back—with copper whiskers soldered onto the nose end.

You place it on one corner of a table top that is divided into squares by a maze of tiny partitions. A mushroom-shaped electrical terminal in another corner represents a piece of cheese.

Mouse Uses Its Head

I pushed a button, and the make-believe mouse stood stock still for a while as if it were thinking things over. Then it went into action. It started scurrying around the first corridor, bumping against one wall, retreating to the center of the alley, trying another wall. After finding its way out of that corridor, it continued exploring the rest of the maze in trial-and-error fashion. Sometimes the mouse retraced its steps to "make sure."

When its whiskers brushed against the cheese at last, it stopped dead. Total elapsed time: two minutes, 10 seconds.

But the most remarkable feat was yet to come. When I put the mouse back at the starting point, there was no bumping into walls, no investigating of blind alleys. The mouse immediately headed in the correct direction, negotiated right-angle turns at the proper places and moved smoothly to the goal without a single slip-up. The second trip took just 13 seconds. The mighty mouse had remembered the maze perfectly!

Next I rearranged the maze. The mouse had to learn new pathways the hard way, but remembered the unchanged parts.

Finally, we gave the mouse an "experimental neurosis" by putting it in a completely enclosed square. After about a minute of futile wall-bumping, the frustrated maze explorer "cracked up" and began running around in circles.

Magnet Does the Trick

How does this strange toy work? "You'll get the idea if you've ever put a magnet on a piece of paper and made it dart around by moving another magnet under the paper," Dr. Shannon explained.

When the magnetic mouse is placed on the metal floor of the maze, it trips an electric switch to signal a strong, motor-driven electromagnet, which moves to the spot beneath the mouse and "grasps" it in a firm magnetic grip. Then the electric field changes so that the steel creature turns through a 90-degree angle, and the magnet moves toward one of the maze walls, pulling the mouse along with it. If that's a dead end, the magnet backs away, shifts the mouse another 90 degrees and tries again.

The electromagnet's movements are regulated by 40 airplane-control relays. The mouse's "memory" takes 50 more relays, two for each of the 25 squares. Each group of two relays can be arranged four ways—on-on, on-off, off-on, off-off—and each arrangement stands for one of the four possible ways out of the square. Thus they remember which directions are blocked off.

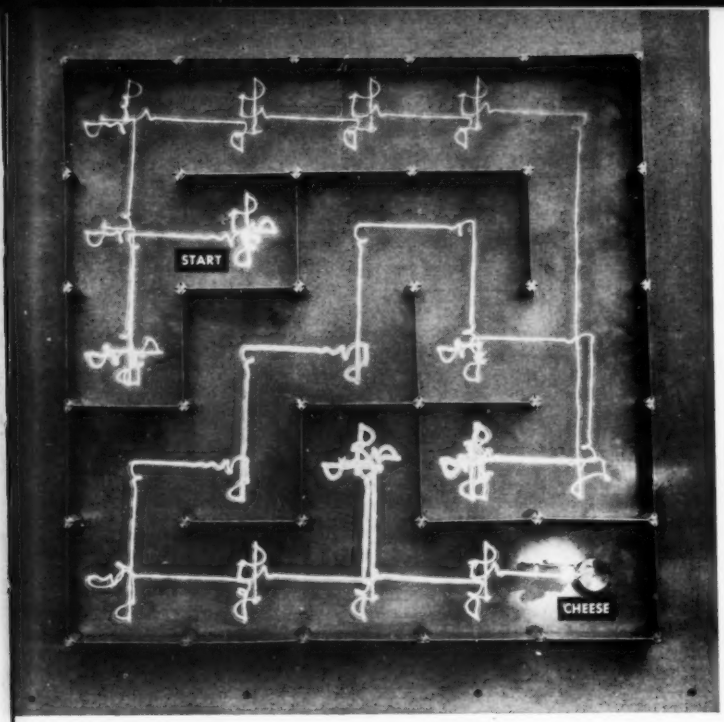
Chess Player Is Next

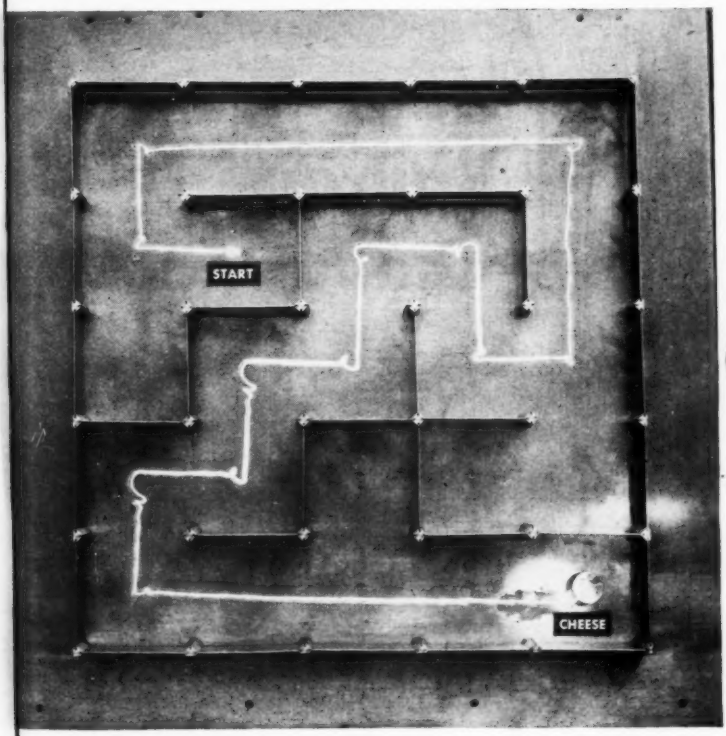
Shannon spent a lot of time building this mouse and a long array of other incredible devices. A robot that may some day play chess stands in his living room now.

If you ask the New Jersey scientist why he keeps building such devices, he'll admit that it's mainly curiosity: "You learn something about machines—maybe, a little about brains. And you never can tell what may turn up."

You never can. Shannon has made important contributions to communication theory, and is working now on a machine that may automatically simplify complex telephone circuits.

Bell Labs officials are also thinking seriously of having Dr. Shannon build another "thinking" mouse. Such mice would make wonderful playthings—but the price is liable to be several thousand dollars.





MOUSE SOLVES MAZE by trial and error on first attempt, as shown by route traced in top photo at left. On second try, mouse "remembers" correct route, avoids blind alleys, and heads straight for "cheese," as shown in bottom photo. First time through maze, mouse starts exploring each square by first trying to head south (toward bottom of photo). If this way is blocked, mouse then turns 90 degrees to the right, tries that side, then turns 90 degrees again until it finds path that is open. Note in top photo that mouse must repeat hunting procedure in each square, even though way may be open straight ahead—unless open direction is south. Then mouse can pass several squares without stopping. As mouse moves through maze, mechanism underneath sets relays that indicate which way it went. On second trip through maze, mechanism simply follows route established by relays, and mouse goes right to cheese.

TO MAKE PHOTOS shown here, the photographer taped a tiny bulb and battery to the mouse. Light then traced path during a time exposure.

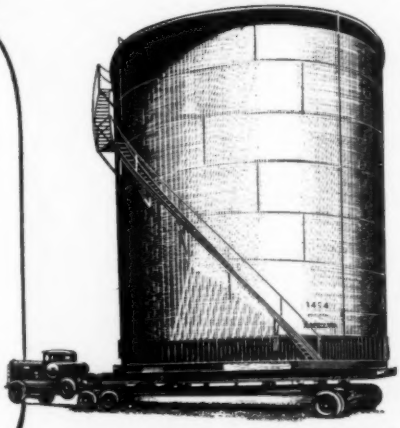
DRILLING RIG at left is carried across desert sands on a trailer with huge nine-foot tires. A tractor moves the 25-ton rig at the rate of five miles an hour.

Huge Trucks Roll on 'Camel Feet'

RAILWAY CAR weighing 65 tons is trundled across Saudi Arabian desert to new railroad between Dammam and Riyadh. Oversize low-pressure tires support car's carrier.

THE Arabs call them rolling camels—these big pieces of automotive equipment that haul drilling rigs and oil tanks over desert sands to the rich oil fields in the Middle East. Contrasting sharply with ancient surroundings, these U.S.-made trucks, trailers and dollies are equipped with huge sand tires that imitate the feet of the dromedaries they replaced when oil was discovered. Engineers calculated the weight camel feet can bear, then designed the low-pressure tires, which spread when carrying a load.

The drawings on these pages, by a Standard Oil Co. of California artist, show some of the machines' desert feats.



OIL TANK, having a capacity of 7,500 barrels, moves to drilling site on a heavy-duty trailer 40 feet long. Fourteen big tires carry the 30-ton load.

One-hundred-ton gas trap is hauled by truck and a dolly 50 feet behind.

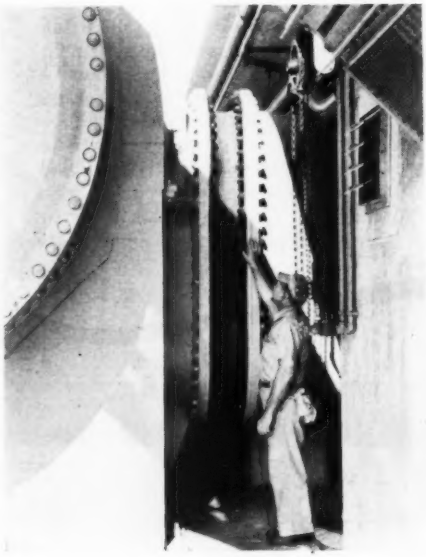
Gas Turbine Powers 'Copter

THAT same gas turbine that is being tested as a power plant for a 21-ton truck (PS, Feb. '52, p. 163) is now flying a helicopter. The Navy and the Kaman Aircraft Corp. of Windsor Locks, Conn., are experimenting with the 175-horsepower Boeing gas-turbine engine in a K-225 helicopter.

The turbine, mounted in the fuselage, drives the twin rotors through a mechanical linkage. The engine has less than half the weight of the piston engine normally used in the Kaman. Other advantages: it needs no clutch or cooling fan, and burns kerosene.

Big Joint Helps Make Power

ONE of the world's biggest joints is this rubber-and-fabric seal in an electric generating station at Houston. It connects a steam turbine and a condenser, compensating for their different rates of expansion and contraction. Made by U.S. Rubber for the Houston Lighting and Power Co., the seal is eight feet high, 21 wide and a foot long.



Step-On Trap Saves Fingers

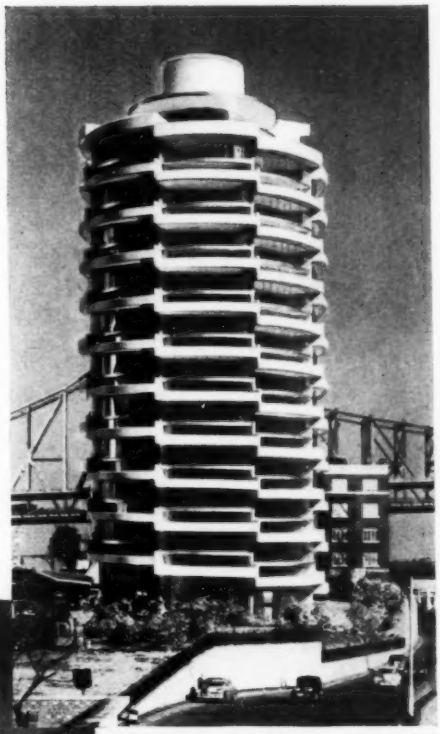
THE first steel trap was invented more than a hundred years ago, but every year brings new designs. This streamlined version (left) of the old mouse catcher can be baited before setting, then cocked by toe pressure, eliminating nipped fingers. The Animal Trap Co., Lititz, Pa., makes it.

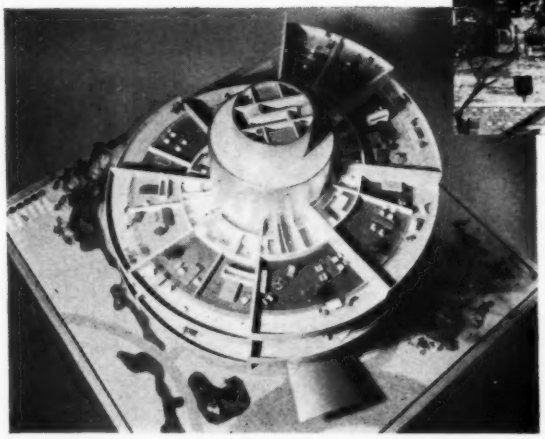
Apartments in Spiral Building Will Grow and Shrink

AN EXTRA room for the new baby would be easier to get in this proposed apartment building than in most private houses. And when Junior grew up and left home, his living quarters could just as easily be turned back to the landlord.

The unusual structure is to be made up of spiraling wedge-shaped units that can be connected to form large apartments or disconnected to make small ones. Since each wedge can also be partitioned with movable walls, a tenant should be able to change the size of his apartment almost at will.

Hanging the whole building on a central core, which will contain stairs, elevators and all piping, is expected to reduce costs. Kitchens and bathrooms will be inside, next to the core. Exterior walls will be almost all glass, and half the wedges are to have open balconies big enough for a child's swing.





HOW HELIX APARTMENT would look if built on New York's fashionable East Side is shown in composite photo above. Plans call for complete air conditioning and combined radiant and hot-air heating with individual controls.

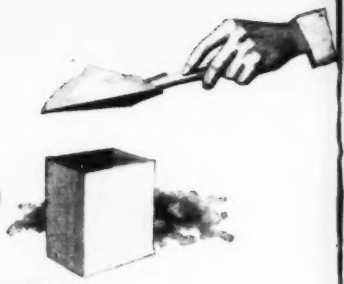
SECTIONAL VIEW at left shows how the three outer rings of the circular structure, planned by Webb & Knapp, are divided into eight "pie slices" with each wedge half a floor (five feet) higher or lower than those on either side.

Oxygen Piped to Patients

ORDERLIES no longer have to wheel heavy oxygen cylinders through the halls of Detroit's Harper Hospital, which uses 300,000 cubic feet—about 1,100 cylinders—a month. Oxygen is now piped—just like water—directly into the patients' rooms from a huge tank outside the building.

In the photo at right, the nurse is adjusting the pressure of the gas as it leaves the wall outlet. Before the oxygen enters the tent, it passes through a temperature-control device.

Humus from Plastic Promises Bigger Crops, Greener Lawns



By Hartley E. Howe

Newest of man's efforts to improve on nature, Krilium makes rain seep through soil without washing it away.

THE Dayton Indians, a minor-league ball club in Ohio, won the Central League pennant in 1951 and at the same time helped scientists test a new discovery. Every time a player slid into base he was checking the effects of a faintly yellow powder called Krilium. It now seems certain to be a potent weapon in our double battle to grow more food and keep the good earth from washing away.

Krilium is a synthetic humus made from acrylonitrile, a plastic that is used for many synthetic fibers. Monsanto Chemical Co., which developed Krilium, says it is from 100 to 1,000 times more effective as humus than manure and peat moss.

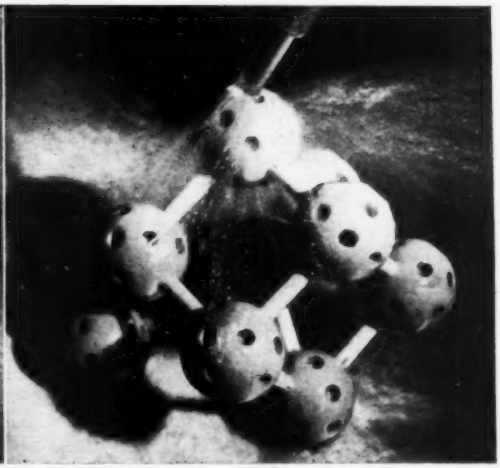
Let's say you have a problem garden—hard-packed soil—and you rake Krilium into it. Your crops may climb up dramatically. Translate your problem into those of the truck gardener or farmer and you see why Krilium has been described by one expert as comparable in importance to the discovery of commercial fertilizer.

Krilium has increased yields of test plots as much as 100 percent. At Ohio State

Krilium is worked into greenhouse soil by scattering it on top, running cultivator down bed.

Geranium on the left was grown in Krilium-treated soil, the one on the right in untreated soil.

TOY BUILDING UNITS, representing particles of soil, show how rain washes off top dirt, packs down rest when humus is lacking. Packed dirt blocks water and air, hampers sprouting.



KRILIUM MOLECULES, represented by rods, now hold "dirt particles" apart, leave space between for air and water. Molecules are locked to particles by electrochemical action.

HIGH-PRESSURE STREAM sprays mix of Krilium, seed and fertilizer on bare banks in test by Connecticut State Highway Department. Krilium must be added to water stream at last moment, between pump and nozzle, because it quickly forms a gummy mass when wet. Spray forms a continuous plastic film that holds soil in place but lets water through.

University, corn crops went up 15 bushels an acre, oats 40 percent, marketable carrots 21 percent. Other tests showed big gains for potatoes, Chinese cabbage, radishes.

Or let's say your problem is merely a potted geranium in the front parlor. Mix a little Krilium into ordinary hard-packed dirt of one pot, then start another plant in untreated dirt. The treated plant will zoom ahead. The biggest rose grower in the country has found that he can substitute a little Krilium for most of the peat moss, compost, sand and vermiculite that he formerly used.

Plastic Film Holds Topsoil

Do you have a steep lawn that washes out every time you seed it? Scatter Krilium on the surface. It forms a plastic film that lets water through but hangs onto the topsoil. And it stays there until the grass comes up to form a cover.

Tests show Krilium keeps land from being washed away as effectively as elaborate coverings of straw tied down to stakes set every four feet. On bare earth at the St. Louis airport, Krilium-sprinkled banks showed little or no washing out after a month; untreated plots were badly eroded.

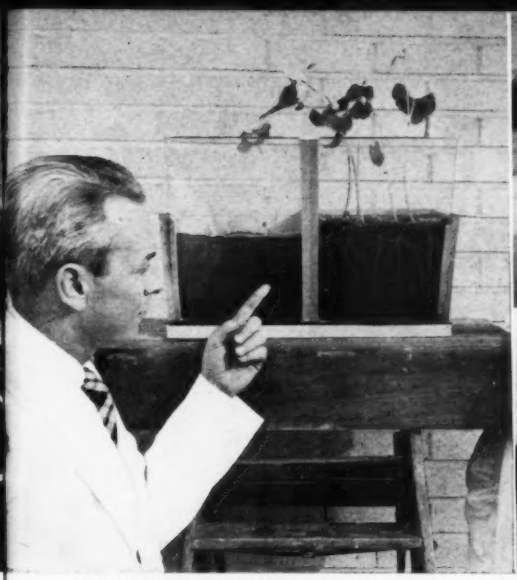
Soon after Krilium was raked into the base paths of Hudson Field, the Dayton Indians began to boast that they had the best field in the league. The dirt dried out faster after a rain. It didn't clog their cleats. Its fine loose surface was just right for sliding into base. And balls that hit the base path always bounced true.

Krilium doesn't provide any food for plants, but it improves the structure of poor soil. Pick up a handful of good soil and squeeze it in your hand. You'll notice that it crumbles into small lumps. Scientists call these lumps "aggregates" and say they should range in size from a pinhead to a pea.

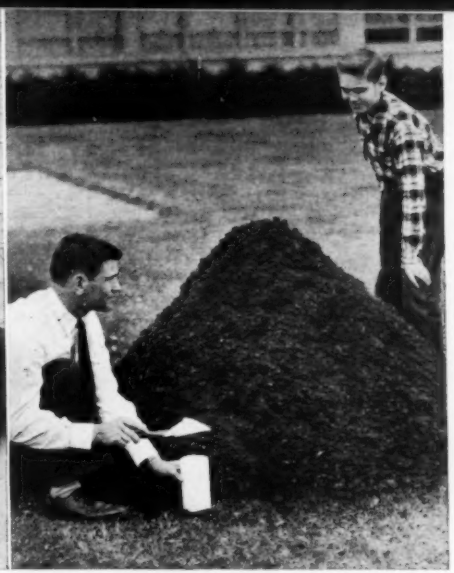
These crumbs vitally affect the way the soil acts when wet. Soil with proper aggregates is porous and lets the rain sink in instead of puddling on top to be evaporated. It also holds the water a long time in the topsoil. The spaces between the aggregates let air down to the roots, which can't properly absorb plant foods unless oxygen is present. The same spaces make it easy for roots to strike down and sprouts to head for the surface.

Farmers Battle Rain, Bacteria

Fine virgin land has a good structure because of the organic matter that has collected in the topsoil. This forms the humus that stabilizes the aggregates. But the natural humus doesn't last long when land is cut over and put into crops. So farmers and nurserymen must wage a constant battle to maintain good soil structure. You do it yourself when you spade up the garden each



FIVE KIDNEY BEANS planted in Krilium-treated dirt (right) sprouted. Dr. D. T. Mowry, co-discoverer of Krilium, points out that only one sprouted in untreated soil (left).



TINY CARTON OF KRILIUM, held at left by Dr. R. M. Hedrick, who shares credit for discovery with Dr. Mowry, does same job on 100 square feet of soil as this pile of peat moss.

spring, raking in compost. Farmers plow under crop remnants or cover crops, dump on manure, rotate their fields between crops and grasses. Still, in a few months the organic matter disappears—destroyed by bacteria or washed out by rains.

Krilium Does Humus' Job Better

Krilium does the same job on soil structure as natural humus, and being a synthetic resin it is resistant to bacteria. In soil with poor structure it doubles or triples the number of aggregates. Forty percent more water is held in the soil. Evaporation slows down 30 to 40 percent. If you try to make a mud pie with Krilium-treated earth, the soil drinks up the water and forms a moist, crumby mass instead of the smeary mess you get with ordinary dirt.

How did Krilium happen to be discovered? Several years ago Charlie Thomas and Ted Hochwalt noticed that corn grew much better in some sections of their Ohio farm than in others. All got the same cultivation, and tests showed that the lagging areas were just as fertile. The difference narrowed down to the soil structure.

Hochwalt and Thomas, no ordinary farmers, have made a career out of solving hard problems. Years ago, as chemists in General Motors' lab, they took part in the basic research on Ethyl gasoline. The consulting laboratory they later set up was so successful that Monsanto took it over complete as its Central Research Laboratory. Now with a hundred patents under their belts, Thomas is Monsanto's president; Hochwalt, vice-president in charge of research.

So when Hochwalt and Thomas faced the problem of soil structure, they turned it over to Monsanto's lab. Peat and compost were expensive and didn't last. But couldn't you *make* a humus that wouldn't have these drawbacks? Dr. R. M. Hedrick, who had grown up on a farm, and Dr. David Mowry were handed the job. "But only give it half time," they were told.

Million-Dollar Search

By the time Monsanto finished, the "half-time job" had grown to a major project. A million dollars had been spent, 700 different compounds had been tested—and Krilium had been invented.

To start with, Monsanto's researchers know something about how organic matter improves soil structure. As organic matter decomposes it leaves certain gums in the soil. These gums, related chemically to starch, are called polyuronides. They act as a kind of natural cement, gluing the soil particles together into aggregates. It takes a lot of organic matter to do this—50 to 100 tons of manure or other residues to produce one ton of gum—and the gum is eaten by bacteria. [*Continued on page 270*]

Plane Engine Powers 150-M.P.H. Hot Rod

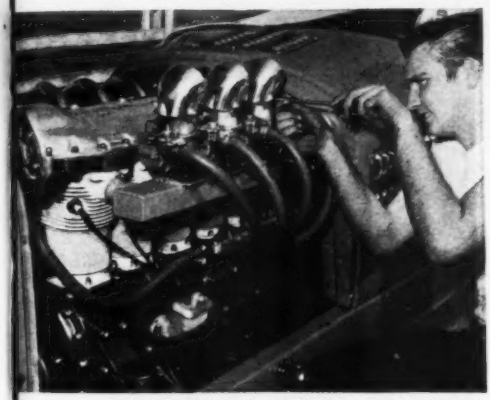
Several old Fords and a training plane provided the parts that make up this trim racer.

DRY-SUMP OILING SYSTEM has separate oil supply and pump to circulate it. A five-quart storage tank is located behind oil cooler, on engine's right.

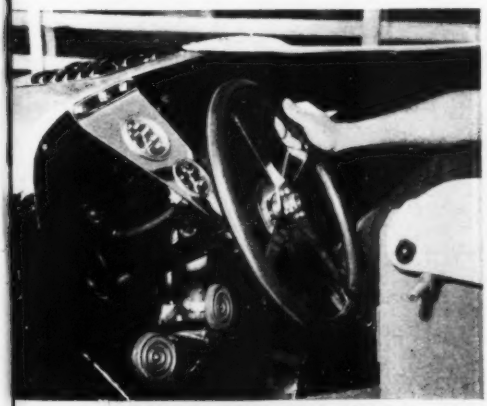
AN AIR-COOLED engine salvaged from a dilapidated training plane now sends a sharp-looking roadster flying down California test tracks at speeds up to 150 miles an hour.

For $100, Jot Horne and Norm Taylor of the Bell Aircraft Co. picked up the 200-horsepower, six-cylinder engine from an old PT-19. They mounted it on a '27 Model T Ford chassis with '32 Ford rails and set a '32 Ford grille in front of it. Then they installed a twin magneto system, five carburetors, and overhead cams with inclined valves that work on roller rocker arms. They topped this off with a V-8 truck clutch and flywheel, and an airplane fuel pump. The pump puts a seven-pound pressure on the gas flow to the carburetors.

TEN MINUTES' WORK on this quick-change rear end enables owners to alter gearing to any ratio from 7 to 1 to 1.94 to 1.



FIVE STROMBERG CARBURETORS (two hidden) supply 200-hp. engine with fuel. Gasoline flows through flexible hoses.

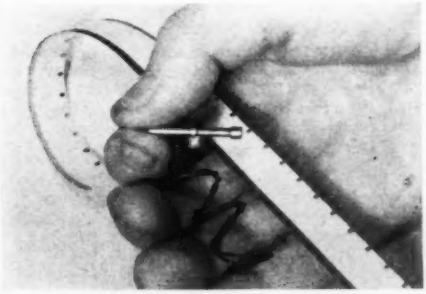


THERE IS NO SPEEDOMETER. The two dials show engine r.p.m. and oil pressure. Speed is judged from tachometer reading.

Rifles Now Unpack in a Flash

GETTING a U. S. Army rifle out of storage is no longer a three-hour job of wiping off heavy grease. Now guns are kept in greaseless, sleevelike packs (right-hand box in photo above) that can be ripped off in a few seconds.

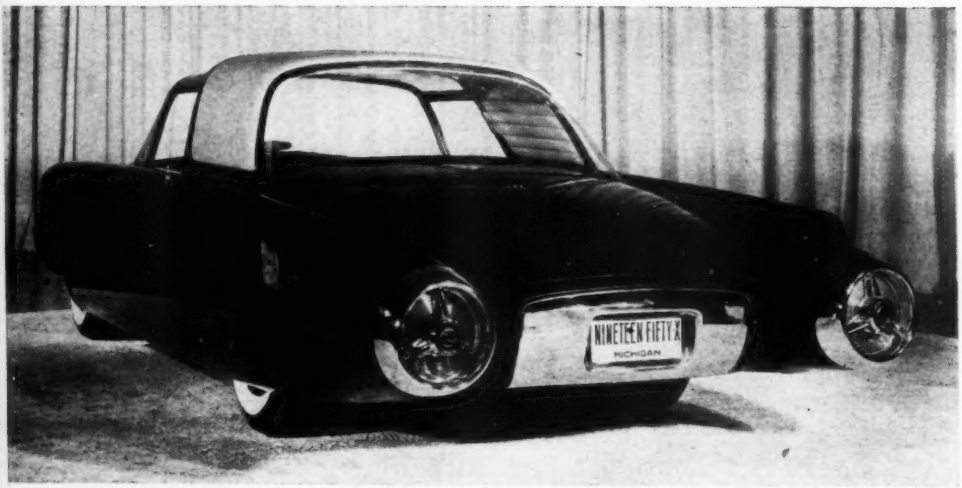
The pack consists of an outer layer of cotton scrim, a layer of plastic-coated aluminum foil, and an inner sheet of kraft paper coated with a chemical. The chemical's vapors fill the pack and form an invisible, anticorrosive film on the rifle.



Adapter Picks Up Movie Sound

STANDARD 16-mm. sound-movie projectors, which reproduce sound optically, can be adapted to use the newer magnetic sound tracks by adding this tiny pick-up head. Part of a kit, the head uses the projector's regular amplifier. Another kit, available soon, has a recording amplifier that will permit owners of sound projectors to make their silent films talk. Both kits are made by Stancil-Hoffman of Hollywood.

Ford Forecasts This

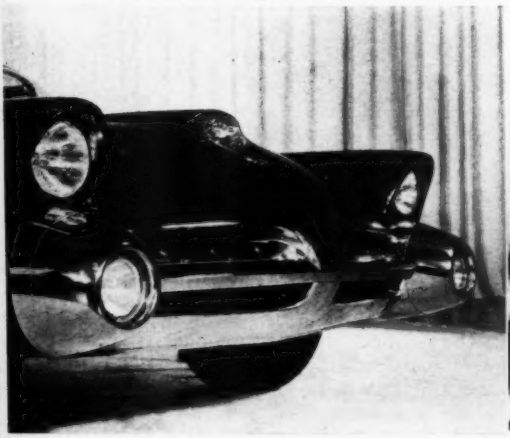


Twin exhausts are centered in the huge, round rear lights, at the ends of finned fenders.

"THIS is really *my* baby," said Henry Ford II when he showed newspapermen his company's 18-foot, four-passenger dream car, the Continental 195X, which has a retractable glass top over its front seat. Rival of GM's Le Sabre, Chrysler's K-310 and Nash's NXI, the car is seriously intended for production.

Ford officials would not discuss details of its engine but said it provides "tremendous increases in power and performance." These result from a new Turbo-dyne high-compression combustion chamber, and better carburetion and manifolding. The car also has power-operated steering gear and brakes.

MID-HOOD LIGHT for parking has been added to the conventional four front lights. The Continental 195X is more than 18 feet long, less than five feet high, nearly seven feet wide.



PLANE-LIKE CONTROL PANEL has levers for brakes, air, automatic jacks, windshield wipers, and hood and rear-deck latches. Pedestal at center has telephone and dictating machine.

Airborne ambulance will tilt wings at take-off to keep wounded soldiers inside fuselage level.

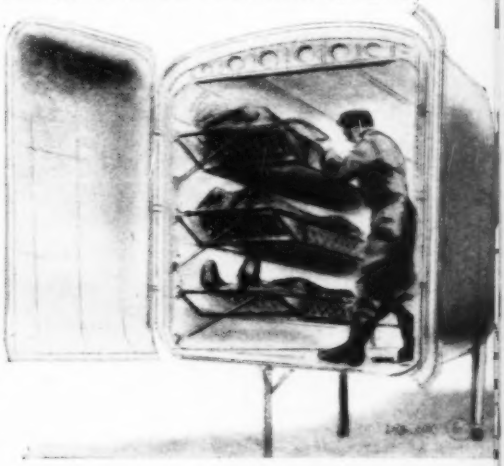
Plane Tilts for Take-Off

A STEEP, almost helicopter-like take-off would be bad medicine for wounded soldiers in this new plane designed as an Army airborne ambulance. So its inventor, Edward M. Lanier, plans to tilt the whole wing-engine-propeller unit at take-off, leaving the fuselage level, as shown in the artist's drawing above. When the plane becomes airborne, the unit will pivot back to its normal position.

The Lanier Medic will not convert to a helicopter in flight but remain an airplane at all times, capable of a cruising speed of more than 200 miles an hour. By using air scoops in the wings and large propellers, however, Lanier claims that his new plane will have the slow speed of a helicopter, be able to hover at close to zero speed and land or take off in a very small space.

An experimental model, scheduled to be built this year, will be powered by twin 400-horsepower turbine engines driving oversize propellers. END

FOR SERVICE NEAR FRONT LINES, rear of the fuselage will be a detachable hospital unit equipped with litters. Separated from the plane, it will stand on built-in telescoping legs.



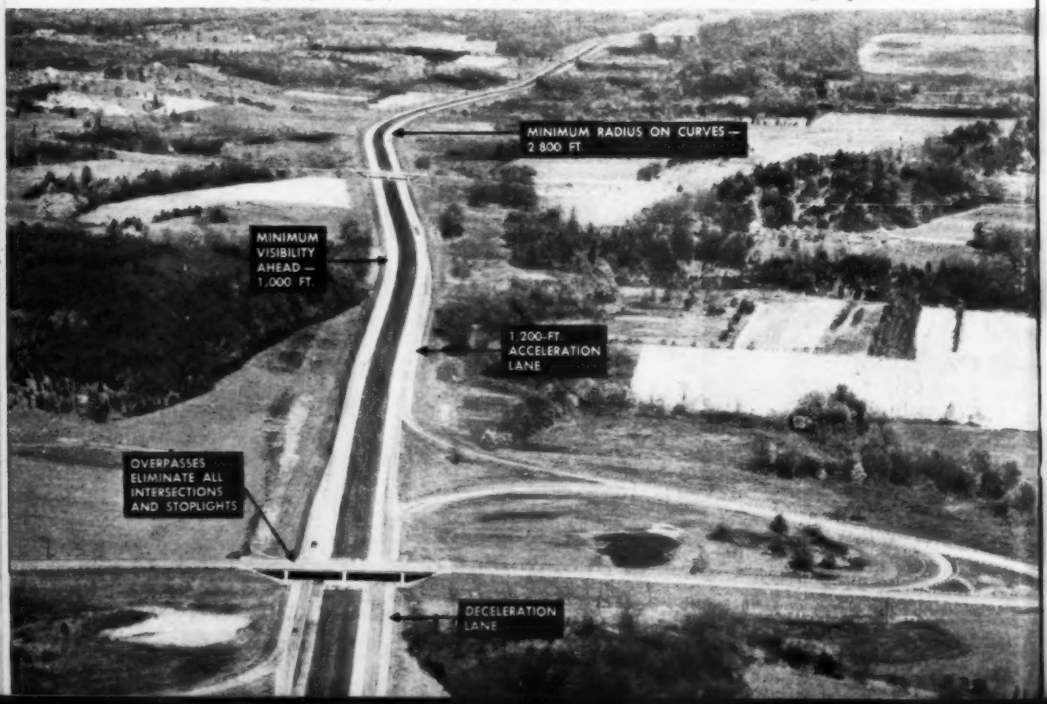
From Broadway Without

By George H. Waltz, Jr.

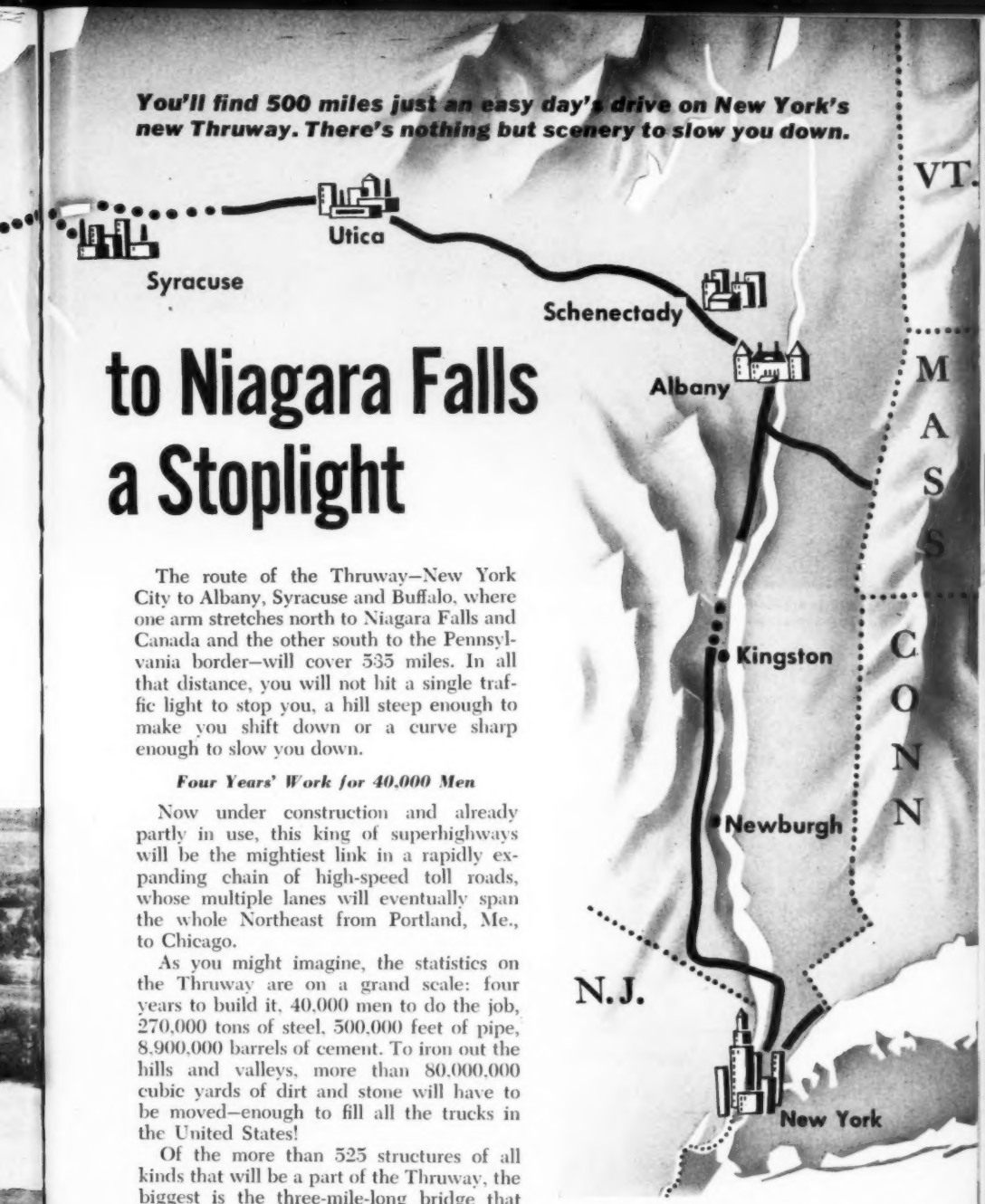
YOU would probably say it was a pretty tough trick at the wheel to drive from New York City to Niagara Falls by way of Albany—something over 450 miles—between breakfast and early evening. And you would be right, in 1952. But by 1954, target date for completion of New York's great Thruway, you will be able to sip your morning coffee to a background symphony of Times Square traffic and that same evening sit down to dinner fresh and relaxed close to the thunder of the mighty Falls.

The trip will be a cinch for the driver. And the whole family will find it a fascinating day of widely contrasting scenery and sights rich in historical significance.

The last word in highway design, the Thruway will be the world's safest high-speed road.



You'll find 500 miles just an easy day's drive on New York's new Thruway. There's nothing but scenery to slow you down.



to Niagara Falls a Stoplight

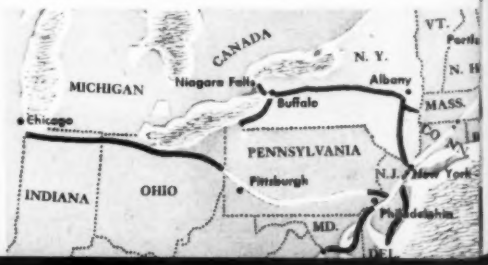
The route of the Thruway—New York City to Albany, Syracuse and Buffalo, where one arm stretches north to Niagara Falls and Canada and the other south to the Pennsylvania border—will cover 535 miles. In all that distance, you will not hit a single traffic light to stop you, a hill steep enough to make you shift down or a curve sharp enough to slow you down.

Four Years' Work for 40,000 Men

Now under construction and already partly in use, this king of superhighways will be the mightiest link in a rapidly expanding chain of high-speed toll roads, whose multiple lanes will eventually span the whole Northeast from Portland, Me., to Chicago.

As you might imagine, the statistics on the Thruway are on a grand scale: four years to build it, 40,000 men to do the job, 270,000 tons of steel, 500,000 feet of pipe, 8,900,000 barrels of cement. To iron out the hills and valleys, more than 80,000,000 cubic yards of dirt and stone will have to be moved—enough to fill all the trucks in the United States!

Of the more than 525 structures of all kinds that will be a part of the Thruway, the biggest is the three-mile-long bridge that



YOU'LL AVERAGE 50 TO CHICAGO. Map at right shows how Thruway (blue line) ties into superhighway network that eventually will let you travel at high speed from East Coast cities to Midwest. Symbols are same as on large map.

THREE-MILE, SIX-LANE BRIDGE across Hudson from Tarrytown to Nyack will look like this when completed. Its 1,000-foot tied-arch central span will be longest of its kind.

will carry six lanes of traffic across the Hudson River between Tarrytown and South Nyack.

Every known technological trick of design and construction is being used to make the Thruway the safest of all high-speed nonstop highways. At no point along the entire thoroughfare will there be less than 1,000 feet of unobstructed visicn. More than 100 interchanges are planned as exits and entrances. Acceleration and deceleration lanes 1,200 feet long—almost a quarter of a mile—will give you plenty of time to get up to parkway speed or slow down for a turnoff. No grade will be more than a molehill rise of three feet in 100. Curves are being engineered to at least a half-mile radius.

The builders are even moving a river to make way for this great road. Five sections of the Mohawk River, busy with barge traffic, are being relocated to provide for the minimum 200-foot right of way that the Thruway requires. And perhaps most important of all, the widely varied landscaping is being specifically designed to help motorists avoid "velocititis"—the deadly, almost hypnotic monotony of driving hour after hour at a constant speed.

As you glide along the Thruway, the scenery, unrolling in an ever-changing pano-

WHY WE NEED EXPRESS HIGHWAYS

Fifteen million vehicles added since the war have intensified our national traffic jam.

Seventy-three out of 100 families now own at least one car. Eight out of 100 own two or more.

A million miles a minute! Every 60 seconds, day and night, a total of another million miles is clicked off by U. S. motorists.

Average annual mileage per car: 9,500. Doctors do about 13,000, salesmen 19,000.

More than 8,000,000 Chevvies, 7,000,000 Fords, 4,000,000 Plymouths are rolling down our streets and highways. More than 2,000,000 each: Buicks, Dodges, Pontiacs.

If you are like most car owners, you spend a solid three weeks each year at the wheel.

We now have more than 60,000,000 drivers in the U. S.—not counting those in the back seat!

Source: Wilfred Owen in *The Lamp*.

SPIRAL-STEEL REINFORCING will tie the concrete to the girders of the Thruway overpasses. Use of columns instead of solid piers will cut down noise, increase visibility.

rama, will bring vividly to life many stirring events of earlier days in American history—the days of the Dutch settlers, of Revolutionary battles, of pioneers trekking west.

Heading north from New York City on a broad six-lane highway, you will pass through the countryside immortalized by Washington Irving when he wrote of Ichabod Crane's eerie encounters with the galloping Headless Horseman.

As you near the old Dutch town of Tarrytown you will get your first glimpse of the massive $50,000,000 bridge across the Hudson. From the bridge you will see the towering Palisades to the south and the Catskills shrouded in haze far to the north.

At Nyack, you will follow the Thruway northward through the legendary land of Rip van Winkle and the historic terrain made famous by George Washington's armies and infamous by Benedict Arnold's treason. You will pass close by West Point, and at Haverstraw you will see the tall, jagged silhouette of High Tor—a stony, hat-shaped mountain used by Maxwell Anderson as the background for his play of that name.

Many times, you won't even be able to see the cars traveling in the opposite direc-

[*Continued on page 262*]

TWO-WAY RADIO connects field office, surveyors and drill barge as spots are located for borings of river bed on which foundation for Tarrytown-Nyack Bridge will be built.

Stripes Can't Stop Jaywalking

To ELIMINATE the hazards of jaywalking in traffic-jammed London, these zebra-striped crosswalks are being tried. That they are not completely successful is shown above: note the pedestrian at left center who evidently plans to cut in front of an oncoming automobile and around the rear of a bus. Other safety measures planned for the crosswalks are nonskid road surfaces and overhead lights.

Plastic Fireproofs Mattress

SMOKING in bed won't be quite so suicidal if the mattress and other fabrics are impregnated with a new resin fire retardant. In the photo above, ordinary cotton flames up when touched with a match (right). Treated with Pyroset, it merely chars slowly (left). The new product, developed by American Cyanamid, can be applied only at textile mills, is said to withstand 25 wet or dry cleanings.

Crash Pad for Death-Seat Passenger Holds Her Lunch, Too

SIXTY-EIGHT of every 100 people killed in automobile accidents are in the seat beside the driver. To make the death seat safer, John J. Chika of Bloomfield Hills, Mich., invented the padded Safe-T-Table shown below. Bolted to the underside of the dash (left), it can be adjusted and fastened at 120 different angles to suit your size and favorite lounging position, Chika says. Once the table is in place, snug against your middle (right), you'll sit tight in the seat even if the driver jams on the brakes suddenly or whams into the car ahead.

The table also serves for eating or writing (center), and as a guard to keep a baby in place on the front seat.

How Atom-Snatchers Can Help You

Magic plastics that swap good atoms for bad now soften water, make whisky better, save lives.

By Harland Manchester

IN a half-million American homes the water is "100-percent soft" today because it passed through a small tank containing a new plastic powder. This synthetic softener, the most efficient ever devised, slashes the soap bill, eliminates bathtub rings, cuts down scrubbing and makes washes whiter. The powder is one of a new family of "ion-exchange resins," an exciting chemical development which since the war has been turned to all manner of uses, and is finding new ones almost every day.

The public first heard of these resins during the war, when the Armed Forces used one in a chemical kit to be carried in lifeboats for desalting sea water. Shipwreck survivors filled a plastic envelope from the ocean and dropped in a briquette of compressed resin which almost magically made the water fit to drink. These resins—close relatives of the stuff that goes into ash trays and other familiar plastic objects—might be called chemical peddlers. They do not dissolve in liquids, but have the peculiar ability of swapping something harmless for something you want to get rid of.

All water solutions are full of electrically charged atoms or groups of atoms called ions. Sodium, chloride and magnesium ions make sea water undrinkable. So by an electrolytic process the resin trades harmless ions for bad ones and chemically locks up the offenders. The result, after straining: fresh water. The kit is now a standard piece of emergency equipment for overseas flying.

This swapping trick makes ion-exchange

LIFEBOAT KIT developed by Permutit makes sea water fresh and drinkable. It uses a "desalting" chemical in the form of briquettes, each yielding one pint of drinking water.

SCALE FROM HARD WATER almost completely clogs a home water pipe. Water-softening chemicals will prevent this.

resins one of the neatest chemical tools of the century. Much of the world's work is spent sifting materials we can't use from those we need, and anyone who can figure out an easier and cheaper separation method has hit the jack pot. Some resins are especially tailored to remove salt, others yank out acids, and still others remove calcium and other elements. On a hundred fronts they are launched on a big career of saving money, booming production and making life easier.

In many American homes the water is harder than is desirable. Thick, hard deposits of calcium and magnesium build up in pipes and hot-water tanks, finally choking the flow so that plumbing may have to be replaced. Hard water uses much more soap, and clothes washed in it wear out too fast from too much scrubbing.

Synthetics Twice as Efficient

Home water softeners have been used for years, but the synthetic resins are more than twice as efficient as older softeners, and with them a much smaller tank can be used. As the water flows through, the resin swaps sodium for undesirable minerals. Once a month, perhaps, when the resins have picked up all the minerals they can hold, the housewife pours in a few pounds of coarse salt and turns a switch; in a few hours the resins are cleansed and ready to use again. The salt goes down the drain, not into the house water system. No single resin is suitable for all areas; dealers analyze water for mineral content before installing the softeners.

Home softening tanks are only nine inches in diameter—at the other extreme is the giant ion-exchange softening plant recently installed by the Metropolitan Water District near Los Angeles, which demineralizes hard water from the Colorado River at the rate of 200,000,000 gallons a day.

First Made in England

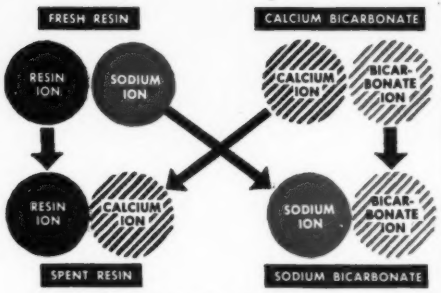
The new chemical tool got its start in 1935 when two Englishmen, Basil A. Adams and E. Leighton Holmes, discovered a method of producing ion-exchange resins from plastics similar to Bakelite. It had long been known that atom-trading chemicals occurred naturally in the soil, but Adams and Holmes launched a new era with their brilliant blueprint for "tailor-making" all kinds of atom-snatchers designed for a thousand-and-one specific jobs. They are now manufactured by the Rohm & Haas Co., the Dow Chemical Co., The Permutit Co. and the Chemical Process Co.

The white coating inside your television tube is made of a powder mixed with water, and faint traces of unwanted minerals may blur the image. A resin is used to yank out the offenders. In the early days of Streptomycin, there was trouble removing impurities without wasting much of the valuable drug. Ion-exchange resins designed for the job greatly increased the yield and lowered the price.

Helped Find New Element

The new tool is invaluable to the Atomic Energy Commission for separating rare elements, recovering radioactive wastes and doing other secret work. When nuclear physicists suspected the existence of the element promethium but could not trap it, J. A. Marinsky and L. E. Glendenin, then working at Oak Ridge, succeeded in isolating the elusive element with ion-exchange resins. Promethium is suitable for night-glowing paints used on watch dials, and is far cheaper and safer than radium.

A few weeks ago, a batch of 500 barrels of Kentucky whisky turned out by a Louisville distiller was mellower because it had passed through beds of ion-exchange resins in a system of tanks invented by A. I. Zarow of the Kentucky By-Products Corp. The



HOW RESINS SOFTEN WATER. Hard water contains minerals like calcium bicarbonate that react with soap, using it up and forming curds instead of suds, as in vessel at far left. In water softener, resins give up sodium ions to the mineral in the water and take away mineral's calcium ions (diagram above). This leaves sodium bicarbonate in the water. Since latter does not react with soap, a little soap produces an abundance of suds, as in other vessel. Same amount of soap (shown in foreground) has been added to each vessel.

resins quickly took out the ingredients which cause harsh odor and biting taste.

In food-processing plants the resins do valuable jobs. Some infants and invalids cannot digest cow's milk because it forms hard curds in the stomach. A resin was devised to remove the calcium and produce a soft-curd milk easier to digest. Resins used in processing corn and cane juices remove the chemicals which form molasses, increasing the yield of high-grade sugar and syrup.

Medical Uses Important

To millions of sick people, the medical uses of the new resins rank first in importance. The first medical ion-exchange resin for the relief of peptic-ulcer patients was introduced to doctors five years ago. It is especially designed to pick up excess stomach acids, which help to cause ulcers and which keep them from healing, and to release the acids in the alkaline intestines where they can do no harm. No matter what other treatment is used, ulcer victims are always told to take antacids after meals. Some antacids, like bicarbonate of soda, eventually defeat their own purpose by causing "acid rebound." Others cause constipation. This neutral resin does neither.

During the last year one of the plastic powders has become a godsend to victims of congestive heart diseases who were once sentenced to exist on salt-free or low-salt diets. These diets, hard enough to follow in the hospital, complicate the housewife's work and are awkward if the patient travels or eats in restaurants. The diet is imposed because the sodium in salt acts as a chemical sponge to hold water in the system, and when the body balance is upset by certain ailments, normal salt intake may cause the gross accumulation of water in the system known as edema, or dropsy.

Heart Sufferers Eat Better

Use of the resin began experimentally when Dr. J. Murray Steele, director of the New York University Research Service at the Goldwater Memorial Hospital, found that many heart patients returned to the salt shaker with unhappy results.

Dr. Steele had worked on a Navy project for the chemical desalting of sea water, and wondered if a similar powder could not be used to desalt people. Other scientists were

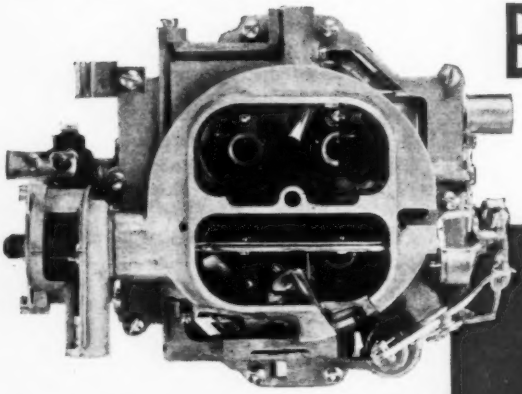
[*Continued on page 266*]

75 *years ago this month*

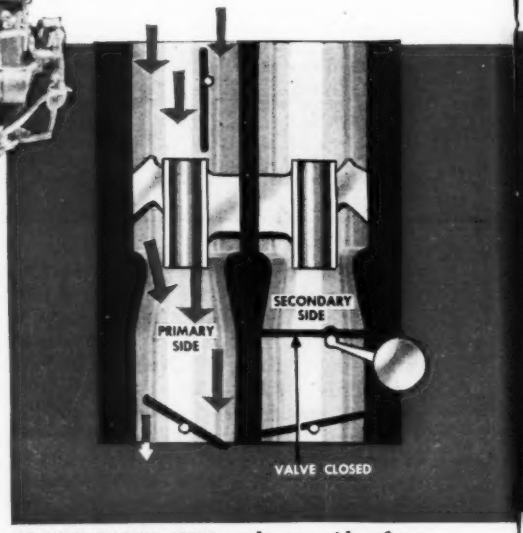
Popular Science Monthly reported:

"THE SEVERAL SURVEYS instituted by our Government across the American Isthmus to ascertain the most feasible route for the construction of an inter-oceanic ship canal have been completed, the result showing that the Nicaragua route is the most practicable. It will take ten years, at least, to construct it, and the cost is estimated at about $10,000,000."

Two-in-One Carburetor Saves Gas, Boosts Power



FOUR-BARREL CARBURETOR, seen from top, adds more than 15 hp. to Roadmaster eight.



AT LOW ENGINE SPEED, only one side of new carburetor delivers gas-air charge to cylinders. Force of incoming air is too low to open counterweighted valves in other side.

By Devon Francis

FOR the last half-century, automobile manufacturers have wanted a carburetor that would swell up like a kid's toy balloon. They wanted one that would be small when a car was loafing along and would grow in size as a driver stepped on the gas.

The Buick division of General Motors has announced one that does just that.

It gives a car more zip. It automatically adds 10 percent to the power of an engine. And it saves gas because it gives an engine just as much as is needed—no more, no less.

The new carburetor, standard equipment on 1952 Roadmaster models, actually is two carburetors sealed back to back as one unit. One of the two, smaller than a carburetor that customarily would be used for the Roadmaster's 170-horsepower engine, does most of the work. It operates all the time. The second carburetor operates only part of the time. That's the way the two-carburetors-in-one grows in size.

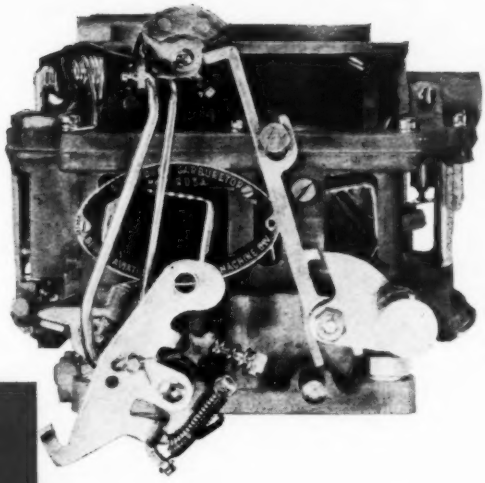
Carburetors Must Compromise

A carburetor's job is to meter fuel—and air—to its engine. The ordinary carburetor never does it quite right. At low speed an engine wants only a small amount of gas. At high speed it wants a lot. At in-between speeds it wants not quite so little and not quite so much.

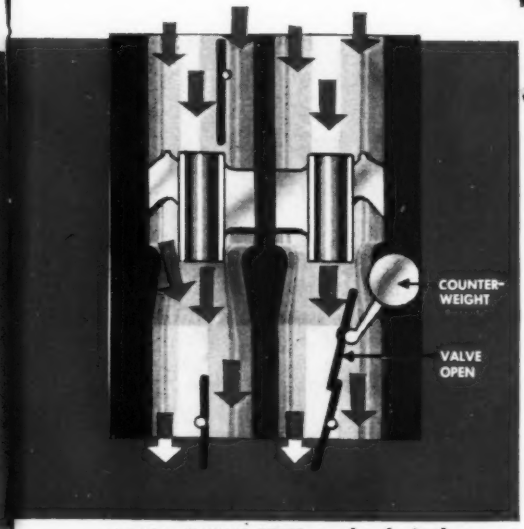
Designing a carburetor to suit all speed conditions has always plagued the people who make car engines. Atomizing jets that would spray just the right amount of fuel for the engine to loiter perfectly would be too small to supply the gas needed as the speed went up. And jets that were big enough for high speed wouldn't atomize the gas at low speed—they would simply dribble drops of raw gas into the intake manifold.

That's why eight-cylinder cars carry carburetors with two "barrels"—two jets and two gas-air mixing chambers. Two jets instead of one permit smaller pinhole open-

It gets bigger when the engine speeds up, smaller when it slows down, pours on the fuel when you want it, yet prevents wasting it when you don't.



SIDE VIEW of expandable carburetor shows one of two throttle levers; second is on other side.



AT HIGH ENGINE SPEED, rush of air depresses counterweighted valves to put both sides in operation. Carburetor gives 2¼ miles per gallon more at 30 m.p.h., 1¾ more at 40.

ings for idling, yet provide enough gas for high-speed performance.

But no matter how many carburetors are put on an engine or how many barrels are put in a carburetor, the problem of spraying a small amount of gas through the jets at low speed, and a big amount at high speed, remains. That's because the pinhole orifice in the jet is fixed in size.

So most carburetors today are a compromise. They operate best at speeds in between idle and high speeds.

Twelve years ago Adolph F. Braun, a Buick engineer, decided something could be done to improve engine carburetion. The war slowed him down, but by 1948 he had drawn a sketch of a carburetor that was really two carburetors in one. Each half contained two barrels. One half would supply the engine with a fuel-air mixture most of the time. The other half would cut in as it was needed.

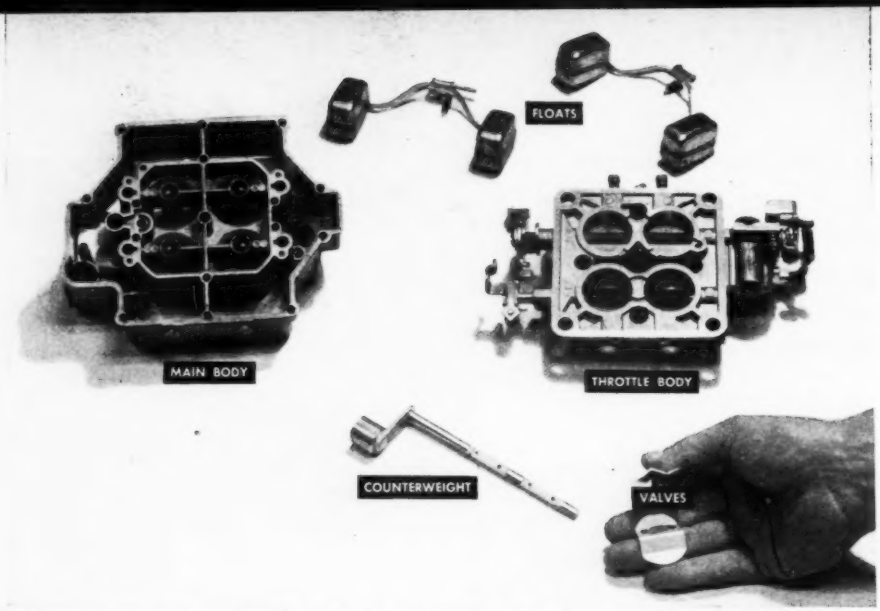
But how to make the second half perform as it should was the stickler. A simple linkage to open it when the accelerator was pushed wouldn't do because that would arbitrarily open it at a fixed throttle position instead of when the engine really needed additional fuel. It would open too soon at low engine speeds, when a carburetor should be kept small, and would not close soon enough after it was needed for a burst of power, wasting gas and impairing efficiency.

Braun tried using vacuum to control his carburetor, but that proved too complex.

Engine Decides

Then one day late in August, 1950, he got an idea. Why not let the engine itself control the carburetor? He installed two valves in the two barrels of the second half of his carburetor and attached the valves to a counterweight. The pull of the counterweight held the valves closed at low engine speeds where the air flow through the carburetor was small. But when he pressed the accelerator hard to rev up the engine, the increased flow of air overcame the counterweight, the valves opened, and the second half of the carburetor went to work.

That way, the engine got more gas only



Carburetor parts show four barrels, four throttle holes. Counterweight weighs 1½ ounces.

when its speed reached a point—about 1,500 r.p.m.—where it began to need more gas. In effect, Braun was doubling the size of his carburetor.

But that wasn't all. Not only did the engine get more gas when it needed more—it got only as much as it needed. At first, the air flow through the carburetor would open the counterweighted valves only part way, adding a slight increase to the fuel-air charge. Then, as engine speed went up and the air flow increased, the valves would open farther, sending a progressively larger fuel-air charge to the engine.

Thus Braun's carburetor could be a tenth bigger, or a half bigger, or any size he wanted it up to twice as big. It swelled up, in effect, like a kid's toy balloon.

Two Carburetors Become One

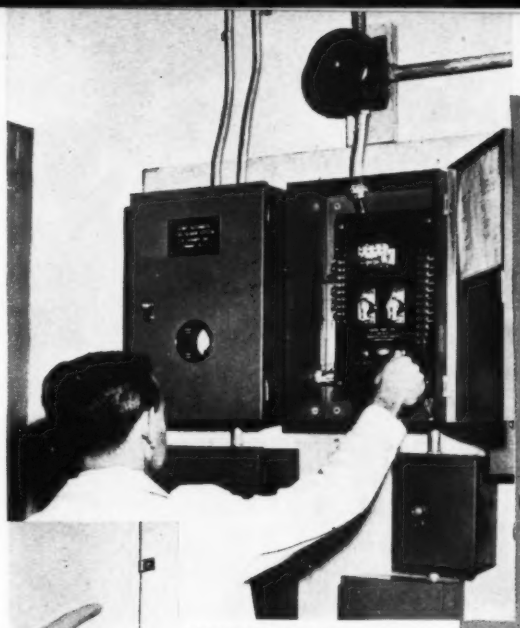
Braun did put a throttle linkage in his final version of the carburetor. It mechanically opens up the two extra barrels when the accelerator is down far enough to drive the car at 80 miles an hour. At that speed an engine begins to use all the horsepower it's got, and it may as well have one big carburetor and be done with it.

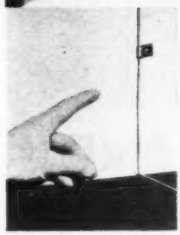
Below that speed, the engine itself determines how big a carburetor it needs for cruising at 40 or 50 or 70, or for extra oomph in passing or getting up a hill.

The new carburetor affords a sharp increase in power—15 horsepower in the Roadmaster—because, unlike standard carburetors that have jets set to compromise between idling and high speed, it does not "starve" the engine at high speed. The two-in-one carburetor gives the extra gas to put out that extra power. It also saves gas by not overfueling the engine at lower speeds, which require less gas.

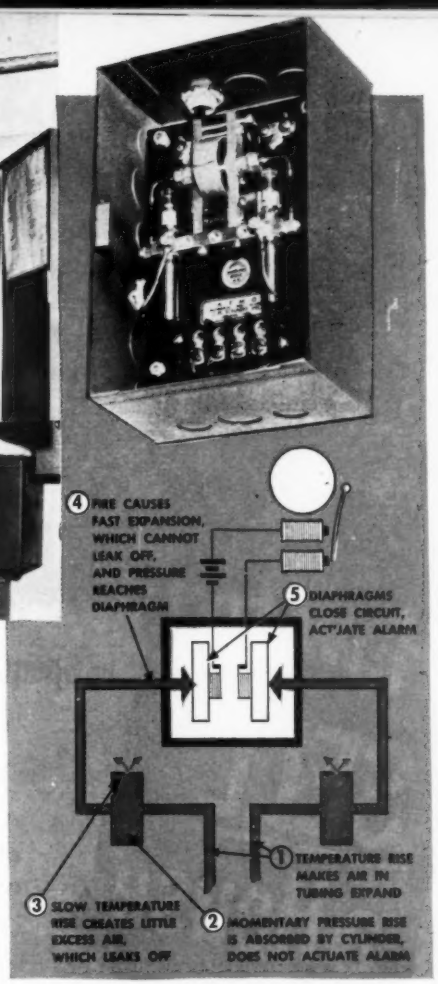
The Buick carburetor, now being adopted by Oldsmobile and Cadillac as well, does for an engine what a feedbag does for a horse—it puts the oats where the engine can get 'em when it's hungry or leave 'em when it's not. END

INVENTOR ADOLPH F. BRAUN (right) discusses new carburetor with Verner P. Mathews, chief engineer. Braun, with Buick since 1928, made first model himself in company shop.





CONTROL BOARD receives fire signals from detectors spotted through plant. Three detectors monitor about 3,000 feet of tubing. Note tubing's small diameter (left).



New Fire Detector Stops False Alarms

A NEW fire-detection system for public and industrial buildings prevents false alarms caused by temperature changes that might not necessarily mean fire. Because the apparatus is activated by the *rate* of temperature rise rather than a fixed heat, it is especially useful in heat-treating rooms and refrigerated areas.

Fine copper tubing on the ceiling of a building is connected to the detector, shown at top of diagram (right above). When abnormal heat expands the air in the tubing, two facing diaphragms are forced together, closing an electric circuit that sounds the alarm. Walter Kidde & Co. makes the new fire-detecting system.

Fliers Get Boy Scout Training

BOMBER crews at Travis Air Force Base in California are being told to "get lost" in the wilds of the high Sierras so they'll learn how to survive after a crash. Each week half a dozen crews are taken into the mountains, given a few days of instruction, and left on their own with hunting knives, .22 rifles and parachutes. In the photo at left, Capt. Norman Hart, bombardier, fashions a no-aching-back pack frame from branches, parachute webbing and shroud lines.

How to SELL a House

Spending $500 on Fixing Up a Place

A dozen real-estate brokers around the country suggest 50 ways to boost its market value.

By Gardner Soule

"YOU can sell a neat home," said T.L. Brummett, a real-estate man in Houston, "or a bargain."

Mr. Brummett put his finger on the first thing a man who plans to sell his house must do: decide whether to fix it up—and try for the best possible price—or to leave it as it is—and be content with less.

How do you decide?

By finding out about what your house will bring in today's market, figuring the cost of any improvements you may make, and determining whether you can make the improvements and yet keep your selling price within the market.

How do you find out the price your house will bring?

By asking a reputable broker, who will know the locality, the market and what it is possible to get. To be doubly sure, ask two or more.

What improvements will help sell a house? What will they cost?

To find the answers, POPULAR SCIENCE has talked to more than a dozen real-estate people in eight different states. All are active in today's market.

Most brokers thought that a homeowner should spend around $300 to $500 in fixing up a house. Only two suggested as much as $1,000. For an expenditure of about $500, the consensus was, you should receive $1,000 to $1,500 more for your house.

"I've never known this to fail," said George Towne, who has sold houses in Des

to Look Its Best Can Bring You $1,000 in Increased Sales Price

Moines for the greater part of a lifetime.

If you leave the improvements to the buyer, Mr. Towne said, he almost always estimates that they will cost him more than they actually will. He therefore becomes reluctant to buy, and if he makes an offer it is a low one.

Said Walton W. Grant of Hartford, Conn.: "A speculator will buy a sound house that looks bad, and fix it up. The owner can spend a little money and make that speculator's profit. Why not do it?"

No one house—except maybe a haunted house—will need all the possible improvements suggested in this article. Most homes need one or more. What you do is up to you. Decide while keeping that eventual selling price in mind.

Here—in approximately the order in which a visiting prospect will see them—are things that help sell a house.

THE YARD

Mow the lawn. "Keep the grass cut if it is spring or summer," said Joseph C. Summersgill of Mount Vernon, N.Y. Most people lose interest in the yard when they plan to sell, but it makes a whale of a difference if its appearance is kept up.

Trim the shrubbery. "Go over the landscaping," said Gordon Williamson in Detroit, "and tear out plants that have been running wild."

"A bed or a planting box helps," said Mr. Brummett, "especially in the South where there's a long growing season to help take advantage of these conveniences."

If your yard is on the bare side, add a tree to make it look less stark.

"I myself bought a place because of one thing—a flaming maple tree," said Frank O'Hara of Jackson Heights, N.Y. "If I were selling a home without a tree, I would put in the tallest one I could—20 or 30 feet tall. It probably would be a maple, because a maple is good looking, easy to grow and will never send its roots through a sewer line. On a tiny city lot I'd add a dwarf tree."

In Glendale, Calif., Guy E. Carlton had a unique story about a yard: "Fifteen prospects had walked away from a large, old house. The property was close to transportation, churches and schools. Each family had two or more youngsters. Then I hit upon

the happy idea of having the owner install a child's play set in the back yard. Cost: $160. The third prospect thereafter bought."

OUTSIDE

Put on one coat of paint. This is usually enough for a good appearance. In the case of a frame house painted an unusual color, like pink or orchid, consider a complete repainting job. "The greatest color of all," said Mr. O'Hara, "where there are trees and grass around, is white."

Said Mr. Brummett: "I know a man who recently spent $350 on painting and got $1,000 more for his house than I thought he would."

Repair the roof. "It isn't enough that the roof doesn't leak," Mr. Summersgill said. "It should look as though it doesn't. An asphalt-shingle roof over the old one is not expensive—three or four hundred dollars for the average house."

Replace any gutters or downspouts that are bad. Paint or replace galvanized iron.

Repair sagging steps and porches. "A sagging porch can frighten customers," said Mr. Summersgill. "We have two houses with such porches for sale right now. I notice a lot of whispered conversation back of those houses every time I show them."

Dress up doors and windows. "If I were selling a brick house, I would spend a couple of hundred dollars on the window trim and doors," said Walter Mayo of New York City. "I'd expect a double return."

Have storm windows and screens for every window, have them in good repair and give them a coat of paint along with the house. Buyers will want them and will look at them.

"Do anything," Marcus G. James of Norfolk, Va., summed up, "that will add to appearance or beauty."

INSIDE

Paint it one coat—the same colors in which it is decorated. "I would *not* redecorate," said one broker. "I couldn't guess what the new owner would want. Nobody can." A single coat of paint will cover any soil and picture-hanging marks on walls.

Put up new wallpaper if you need it. "You can do it yourself," said Frank O'Hara, "with the new wallpaper you wet and stick on."

Scrape and varnish a good hardwood floor. Floors stand out in an older house, almost more than anything else. Show them off, if yours are good.

Fill any cracks in the ceiling, eliminate sags and paint it.

J. A. Hurry of Monmouth City, N. J., came up with some inexpensive ways to improve walls, ceilings and floors:

"People want lath-and-plaster walls," he said. "Don't let this discourage you if yours are wallboard. You can plaster right on top of wallboard.

"If the ceiling were in bad shape and cracked, I'd use 12 by 12 ceiling tiles instead of replastering. They're very reasonable.

"If the floor were in really bad shape, I'd put rubber tile over it."

KITCHEN

Make it bright and modern—even at the expense of adding new equipment. "The women," said R. R. Lassiter of New York City, "buy kitchens."

To show off your kitchen best, and to make it look bright, cheerful and as big as it is, said George B. Netherton of New York City, put in brighter light bulbs. "It is often wise," he added, "to install a fluorescent light." Frequently you can just screw in a new fixture.

Paint and dress up the kitchen. Said Guy Carlton: "Redone drainboards and tile in the kitchen prevent questioning glances." One coat of paint in the kitchen, he pointed out, will hide stove-grease marks.

Add equipment, if necessary, to modernize. Said George Towne in Des Moines: "In one case a new sink sold the house, we think."

Said Gordon Williamson, Detroit: "Install an electric garbage disposer, if the house is in the $15,000 class. If in the $20,000-to-$30,000 class, add a dishwasher."

Do

. . . have tax receipts and fuel bills handy so that you can answer a prospect's questions about them convincingly.

. . . put your home on the market, if possible, during the house-hunting season—March-May. Avoid July-August and November-January.

. . . put a "For Sale" sign on the house to draw attention of passers-by and to get the help of neighbors in selling.

. . . show your house at the convenience of the customer: after 5 p.m., on holidays and Sundays, even on Sunday mornings.

. . . treat a prospect's teen-age daughter like an adult. Her opinion carries a lot of weight with her parents.

. . . say so if your house has been built by a well known builder in the community. It's a good recommendation.

. . . emphasize it if a house is well financed—a great advantage. A $14,000 house with a $12,000 GI mortgage is well financed.

. . . say so if a house has always been owned, and never rented. The average man who owns a home takes better care of the property than a tenant would.

Don't

. . . high-pressure a prospect. You may high-pressure a man into buying a $5 article, not a $20,000 article.

. . . jump at the first offer, which is usually too low.

. . . omit the price from a classified ad. People who do are often ashamed because they're asking too much. The public has caught on.

. . . keep interrupting when the broker brings a prospect. A persistent owner can spoil a sale.

. . . feel badly if you haven't sold the house in a given length of time. It can take from one day to 1½ years.

. . . worry if a person doesn't give you the real reason he turns down the house. People rarely do.

BATHROOMS

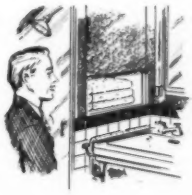
Have them also bright and modern.

"The men," said Mr. Lassiter, "buy bathrooms. Often a man inspecting a home will stray off and look at the bathroom."

They look for a shower, an outlet for plugging in an electric razor, and a big washbowl with lots of light. Put a 75-watt bulb over a washstand.

Install colored tile. At least six of the real-estate people noted that this is a real seller. Pastel colors are most popular. "You can get tile in sheets," Mr. O'Hara pointed out, "and it isn't hard to put up."

Consider adding a shower door. "It costs about $35," said Mr. Carlton. "It adds a modern touch to an older house."



Hide that old tub. Not one of the professional house salesmen I talked with thought he could sell a house with an old tub, the kind that perches up on legs.

Add a powder room on the first floor if you don't have one. From New York to California this is a must. Lots of old houses have a pantry that will do.

BEDROOMS

Show how big they are. Leave your furniture in them, if you have the choice. Michael J. Cavanagh, New York City, said

that, contrary to many opinions, a bedroom often looks smaller when empty. He finds that people in an empty room overestimate the space a double bed will take.

Paint for size. "I'd paint one wall a different color from the other three," said Mr. Hurry in Monmouth City, N. J. "That way the room will look bigger."

Turn a bedroom into a television den. "TV means more to a sale than some people realize," said Guy Carlton. "When painting, dress a bedroom as a den. Suggest to prospects that here is a good place for the TV set."

ATTIC

Keep it clean. "Dust it out," said Mr. Summersgill in Mount Vernon, N.Y., "so customers will not have to push cobwebs aside to see it. A clean attic storeroom will leave a good impression."

BASEMENT

Clean and/or paint it. Consider adding a playroom. A clean basement really catches a buyer's eye—because he sees so many that aren't orderly, according to Mr. Netherton. He said, "Most men will move before they clean up their basements."

Brighten it if necessary. "Whitewash or paint," said one broker, "will make all the difference in the world." A gloomy basement cluttered with all kinds of odds and ends, Mr. Hurry pointed out, can look dangerous when it isn't at all.

Consider a rumpus room. "If I were a handyman," one real-estate man said, "I would build plasterboard walls in the cellar to make a playroom. This will stay in a buyer's mind and bring him back to sign the papers." Five or six other brokers agreed.

FURNACE

Install a thermostat if you don't already have one. The consensus was that the ideal heating system would be central, automatic and thermostat-controlled, but that because of expense a new furnace should not be installed. Central heating, Mr. Brummett said, has come into its own even along the Gulf Coast and is almost a requirement for houses costing more than $14,000.

Clean the furnace. "This makes it appear well maintained," one broker said. "Otherwise, the furnace may be good but look bad."

The one man who had a success story about adding equipment in the basement was Guy Carlton. "In an area of hard water," he said, "I insisted that one owner install a water softener before I would try for a sale. To each prospect I pointed out how science was bringing soft, pure, palatable water into that house. The third one bought. For $300, the owner made a doubtful sale certain."

GARAGE

Clean it up.

"Sometimes," Mr. Summersgill said, "a man fixes up his house and forgets the garage, which sits there like a chicken coop."

The main thing, Mr. Netherton thought, was to have the garage clean so that customers would see at once it was big enough for their car.

OTHER CHANGES

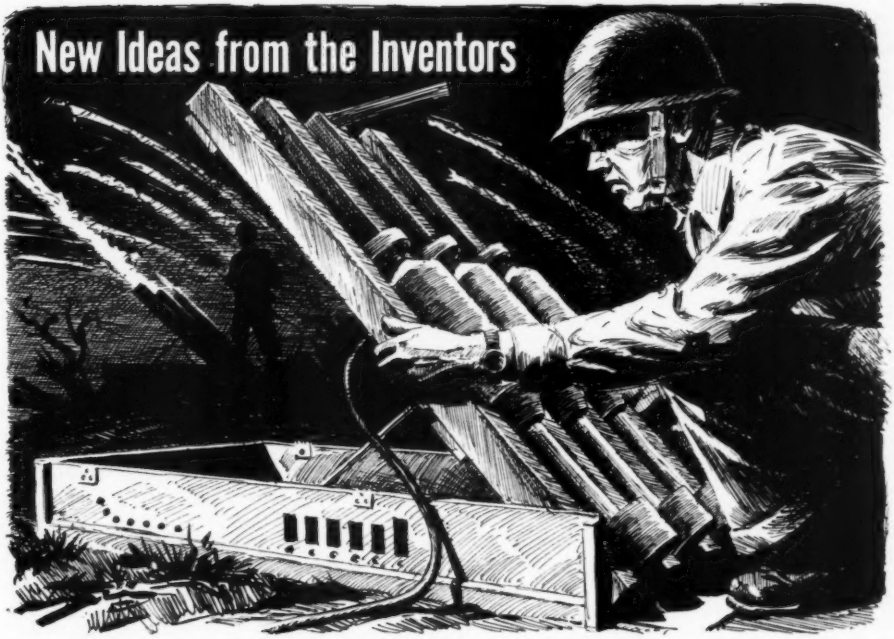
There are big and small things besides those already mentioned. The general rule to remember is: consider cost and add carefully.

If a house doesn't have copper or brass plumbing, it should. Most houses less than 20 years old have one or the other.

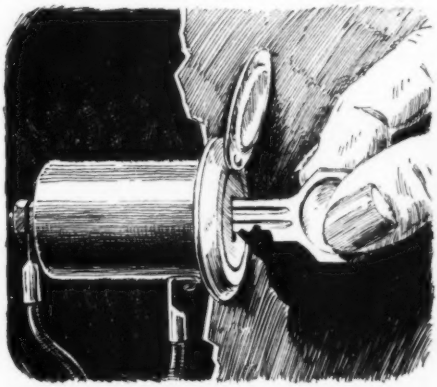
Insulation should be installed, at least in the attic. This has become standard equipment, and other houses on the market have it even if yours doesn't.

[*Continued on page 264*]

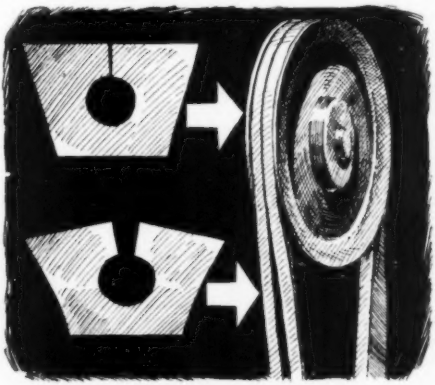
New Ideas from the Inventors



1 "Suitcase" to Launch Rockets. Soldiers wouldn't have to carry heavy rocket launchers into battle if the rockets were packed in this protective case, its inventor claims. The case serves as launcher as well as carrier when the cover is removed. The hinged rack holding the rockets can be raised to the proper aiming height by locking a pair of metal legs into one of several slots in the side of the case.



2 Key Warmer to Unfreeze Car Locks. This tiny electric heater, mounted near a car-door lock, would warm up your key so you could insert it into a frozen lock. Its heating element would be connected to the battery through a spring switch that would turn it on when the key was pushed in. The warmed key would then defrost the lock.



3 Slotted V Belt to Wear Longer. If V-belts were provided with open tops and hollow centers they would wear longer and slip less, says this inventor. The open top would provide air circulation for cooler running, while the hollow center would allow the belt to "give" and make a closer fit in the pulley groove.

Please turn the page for three more new ideas.

4 Safe to Foil Burglars. A burglar trying to crack a safe fitted with this attachment would find himself in for a surprise. Any attempt to knock off the dial would immediately release a noxious gas. The attachment, consisting of two easily broken containers of gas, is designed to be mounted on the inside of the door behind the dial.

5 High Chair to Fold. This idea would solve the problem of where to put Baby's high chair when it's not in use. The light tubular frame has pivoted joints and hook-in fasteners. The seat and tray would drop down and the sides swing inward, permitting the chair to fold up flat like a step-ladder for easy storage in a closet.

6 Doll to Grow. Baby dolls, which now do practically everything but get bigger, would do just that with this invention. A clockwork motor in the upper half of the body would gradually pay out a cable attached to the lower half. This would let two springs expand, pushing the sections apart to give the effect of growth.

Patents on these inventions have been granted to: 1. F. Lindvall, Altadena, Calif., and P. Lloyd, Pasadena, Calif.; 2. A. Drugan, Columbus, Ohio; 3. C. Dean, Denver; 4. H. Srygley, Abilene, Tex.; 5. M. Rosenjack, Cleveland; 6. W. Moyers, St. Augustine, Fla.

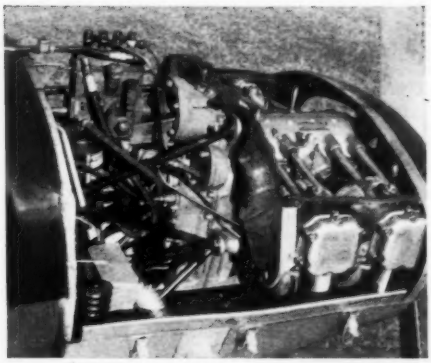
Jeep Takes to Italian Hills

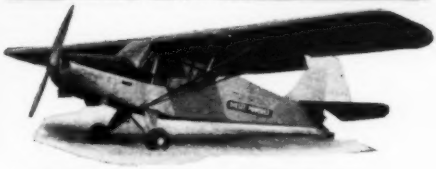
ITALY likes the jeep, too. Influenced by the scores of American military models left abroad after the occupation period, Fiat designed the Italian version shown at right. Intended for civilian use, it has a four-cylinder engine with four forward speeds, and will climb the steep Italian hills or ford streams. A fitted tarpaulin encloses the top and sides during bad weather.

Periscope to Shoot the Sun

TO PROTECT their navigators, pressurized planes may soon carry periscopes—part of a new sextant—instead of the plastic astrodome "bubbles" that have been known to blow apart in high altitudes.

A permanent mounting, fitted to the aircraft skin, holds the sextant in place. A plate seals the top of the mounting when it is not in use, maintaining pressure inside the plane. Safety catches prevent opening the seal until the sextant has been inserted, or withdrawing the instrument until the seal has been closed. Made by Kelvin & Hughes, Ltd., England, it is shown above installed in a de Havilland Comet.





Diesel Powers Light Plane

THE first small aircraft Diesel ever to be built in this country has been tested successfully at Conway, Pa., by a lightplane manufacturer. Run on kerosene or other low-grade fuels, the 245-pound engine can deliver 125 horsepower. That compares favorably with aircraft gasoline engines of similar size. It has four cylinders with a 4⅞-inch bore and a 3⅞-inch stroke.

The engine overcomes a Diesel's worst fault—roughness—by a special combustion chamber which "softens" the compression of the fuel-air charge. It was made by Diesel Power, Inc., and test-flown in a Taylorcraft plane.

PS PHOTOS BY W. W. MORRIS

The 1952 Ford

THREE-SPINNER GRILLE, higher fenders, flatter hood characterize new Ford. Inset headlights with extended rims contribute to car's appearance of greater length. Among the body styles available are those shown at right.

LONG, LOW LOOK of '52 Ford is typified by Victoria. Bumpers wrap farther around longer fenders. Wheelbase is 115 inches, an inch longer, but over-all length is up only half inch to 197.8.

Ranch Wagon

Club Coupe

Fordor Sedan

Is All New

Victoria Hard Top

A red-hot six-cylinder engine with overhead valves hides under the hood of the redesigned Ford.

By Wilbur Shaw and Devon Francis

REPORT FROM THE

DRIVER'S SEAT . . .

THE engineering test driver asked, "Ever accelerate to 60 miles an hour in 12 seconds—in a stock six-cylinder car?"

He nodded toward a Ford equipped with a spanking-new 1952 engine. It was Ford's big news—among several other items of news about Ford—announced last month: a stock-car hot rod with overhead valves.

Without waiting for an answer, the test driver added, "Well, here's where you do it."

We were entitled to a doubt. Fast acceleration in open sports cars was one thing. A jack-rabbit start in a six-cylinder sedan was something else again.

We climbed aboard, stop watch ready. Our fairway for a series of trials from a standing start was a concrete runway at the old Ford airport in Dearborn, Mich., now made over into a test track for the company's products.

The engine was loafing at idle and we tapped the accelerator a couple of times to see how sassy it was. It hummed. Except at idle, it seemed as smooth as a sewing machine. The day was windless.

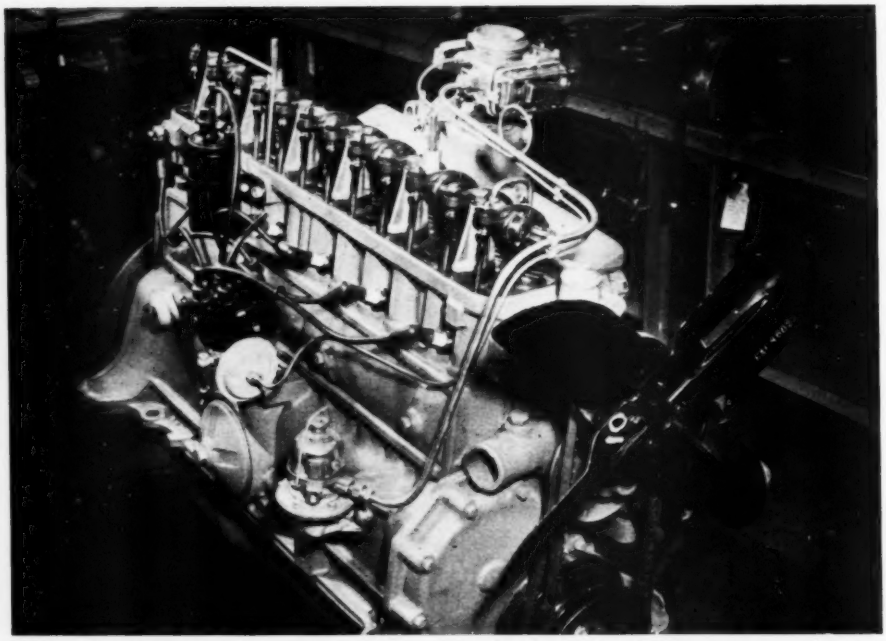
60 M.P.H. in 12 Seconds

The car was a standard gearshift job. We let in the clutch and let 'er roll. She streaked away like a homesick angel.

We hit 40, then 50, and just as the speedometer needle edged into the 60 stripe the stop watch read 12.1 seconds.

"She'll beat that," insisted the engineer.

We tried again. Sure enough, we did better—11.9 seconds. Just to be sure, we did it



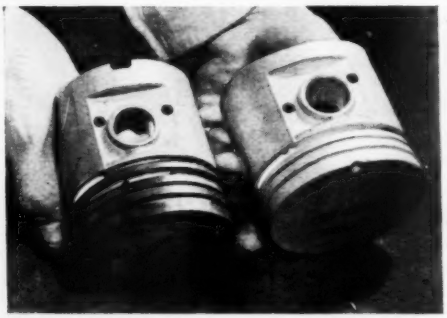
OVERHEAD-VALVE SIX (shown with cover removed) has such unusual features as built-in oil filter and carburetor float bowl made of glass. Compression ratio on six is raised from 6.8 to 7 to 1, on eight from 6.8 to 7.2 to 1. Respective horsepowers are boosted from 95 to 100 and 100 to 110. While six has no hydraulic valve lifters, Ford hints of development of simpler way to accomplish automatic lash adjustment.

once more. Same score. The speedometer error at 60 was three miles an hour, giving us a net of 57 in less than 12 seconds.

In fairness, we must add that the car we drove was a "hybrid" used exclusively for engineering test work. Its 1952 engine was mounted in a 1951 car. New models, slightly heavier, may not be quite as fast—by as much as two seconds.

Now we rolled the car onto the proving ground's high-speed loop. If Ford was getting acceleration with a geared-down rear axle, it would show up in a lower top speed.

The Ford loop wasn't built for much over 85 miles an hour. Except for one short straightaway where an automobile can get its second wind, it's all curves, insufficiently banked. So three miles an hour are arbitrarily added to a top-speed reading to erase the "track penalty" on a car.



BIGGER PISTONS and shorter connecting rods have converted new six into a "square" engine—bore and stroke are nearly identical. Both six and eight burn nonpremium fuel.

The needle was indicating 98 when the engine said that was the best it could do. Speedometer error amounted to six miles an hour. The net, allowing for the track penalty, was 95. Ford had *not* altered its rear-axle ratio to favor acceleration over speed.

The engine obviously was a crackerjack. It almost had to be. It was five years in the making. It replaces a six that was built primarily as a truck engine but could be ordered in a passenger car when a customer wanted six-cylinder economy. Ford has never really tried to sell its six-cylinder cars since their introduction in 1940. It won't push the new six—brought out frankly for competitive reasons—at the expense of its eight. The V-8 will remain its bread-and-butter car.

More Power, Less Waste

The new six turned out to be so good that Ford had to improve the performance of the eight to make the six keep its distance. In the new engine Harold Youngren, vice-president of engineering, has achieved something he has been trying to do for years. He has slashed friction. Friction eats up fuel in all internal-combustion engines.

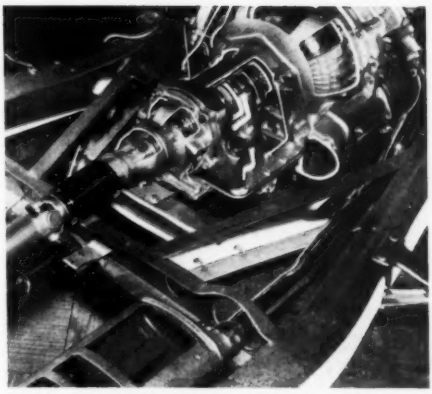
In the old six, the friction loss within the engine amounted to 48 horsepower at 4,000 r.p.m. Now the loss is only 31 horsepower.

A lot of tricks of the trade went into that performance. For one thing, the engineers redesigned the combustion chamber for better burning of the air-gas charge. That permitted them to shorten the stroke without a loss of power. And that, in turn, cut down the "rubbing velocity" in the cylinders. Result: less friction.

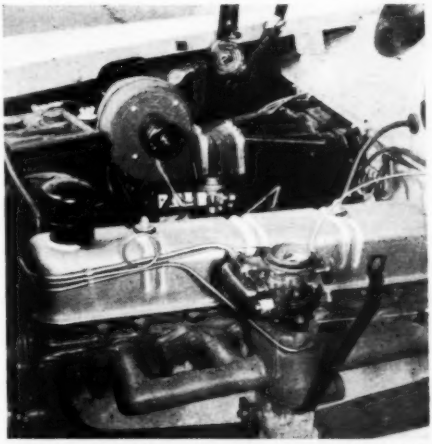
Overhead Valves Cut More Friction

Going to overhead valves saved Ford the complicated boring of the engine block necessary in the old L-head design, which had the intake and exhaust ports in antechambers. That produced a stiffer block and less cylinder distortion—or, in ordinary language, less bending of the cylinder under the impact of the explosions. And that, in turn, let them eliminate one oil ring. Result: less friction.

They did some other things. They put a four-port intake on the manifold where only three grew before. That was a puzzler until one of the company engineers answered a question with a question: "What would you do with a three-port manifold if, some day, you wanted to go to dual carburetors?"



FRAME IS MADE MORE RIGID by K-shaped member enclosing transmission and an extra cross member to which spraddled rear shocks are attached. Cutaway transmission shows Fordomatic's torque converter and planetary.



HEATING SYSTEM, mounted completely inside engine compartment out of the way of the feet, is visible on far side. Battery was moved from left to right side for better weight balance. In four-port intake, four end cylinders are Siamese, middle two singles. Fuel pump has been repositioned in air stream to forestall any vapor lock in hot weather. Hood hinges are redesigned for easier opening.

They did something brand-new in overhead-valve design—they dropped the "pan rail," where the oil pan meets the crankcase, 2¼ inches below the centerline of the crankshaft. This not only adds to the stiffness of the engine block but, affording a flat pan, gives a better crankcase oil seal.

The new six and the improved V-8 have been snugged into a new chassis and

GROUPED INSTRUMENTS are shaded better against reflections. Steering ratio is upped to 26 to 1. Front door opens an inch wider, rear door four inches, to provide more entrance room. Hinges are adjustable.

RECESSED SECTION OF DOOR is all in one plane. This assures a weather-tight fit in a place where leakage occurred in some '51 models.

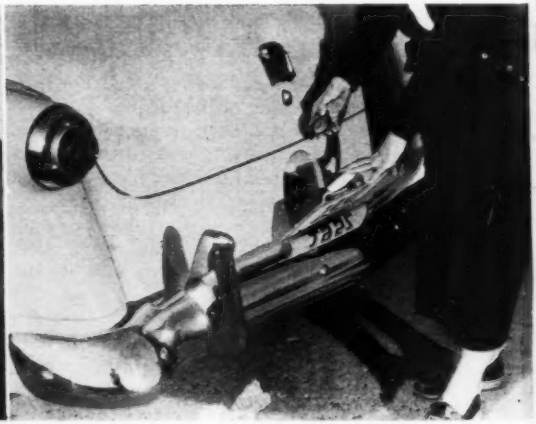
wrapped with several new body styles. The Ford, by the way, is one of only four new American automobiles—new from bumper to bumper—for '52. The others are the little Willys we described in PS in January, the Lincoln and the Mercury. The company was too far along with its plans for a new car—its first major change since 1949—to abandon them when the government decided to drop the boom on the industry for the defense effort.

A new car isn't new without new gimmicks. The Ford has some. The brake and clutch no longer thrust up scimitar-shaped from the toeboard. They hang, just as they do on the Lincoln and Mercury, freeing the toeboard of obstructions and eliminating some winter drafts.

Find the Filler Cap

The starter motor has lost its whine when the engine balks. Its pinion gear grabs the ring gear of the flywheel and hangs on like a bulldog until the engine is turning up 400

PENDULUM-PEDAL IDEA was borrowed from Ford-made British cars. Rear seats, as well as front, are now foam-cushioned in all models.



GAS FILLER PIPE is hidden behind license plate. Tank holds a gallon more—17. Tail-light unit resembles jet-plane exhaust.

FACTS ON '52 FORD

Model: Customline Six four-door sedan.

Engine: 6-cyl. overhead-valve; 101 hp. at 3,500 r.p.m.; car weight per hp., 32.78 lb.; bore and stroke, 3.56" by 3.6"; compression ratio, 7:1; piston displacement, 215.3 cu. in.

Engine piston travel: (in feet per car mile at 20 m.p.h.) 1,284.

Crankshaft bearing surface: 31.5 sq. in.

Torque: 185 lb.-ft. at 1,300-1,700 r.p.m.

Transmission: 3-speed synchromesh; overdrive, Fordomatic optional.

Rear-axle ratio: 3.9:1.

Steering ratio: 26:1.

Radius of turning circle: 19.1 ft.

Effective brake-lining area: 172.52 sq. in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 3,250 lb. (approx.); height (normal load), 62.3"; over-all length with bumpers and guards, 197.8"; width, 73.9"; wheelbase, 115"; overhang, front 35.4", rear 47.4"; tread, front 58", rear 56".

Inside dimensions: seat-cushion width, front 58", rear 57.5"; leg room, front 42.8", rear 41.5"; headroom, front 35.4", rear 32.2"; seat height, front 13", rear 13.5"; vertical distance, steering wheel to seat cushion (minimum) 5.9"; front-seat adjustment, horizontal 4.1", vertical .25".

Tire size: 6.70 by 15.

r.p.m. Up to now you couldn't get that except with a Fordomatic transmission (PS, Dec. '50, p. 94). Now it's on all Fords.

The emergency brake has a pulley now to give a driver more leverage with less effort.

And when you drive into a gas station and ask the man to fill 'er up, he pokes the hose into a hole hidden by a spring-hinged rear license plate. No more dragging the hose across a freshly washed rear fender and deck lid when you stop on the wrong side of the pump. Ford engineers found that it took the average pump jockey two seconds flat to discover he could hold the license plate against its spring by using the gas filler cap as a wedge. The casualty rate of filler caps that walk off in the pockets of attendants ought to drop sharply this year.

We couldn't leave Dearborn without having a crack at the toughest grade on the Ford proving ground in the new six. We had stalled many cars of various makes on this 30-percent grade, trying to reach the top in high.

Ford Surprises Even Ford

We backed off, accelerated to 30 and took the hill in high. It was a breeze. Then we tried climbing the hill in high with a running start of only 15 miles an hour.

"That's asking too much," protested our engineer friend.

Up went the six without a murmur.

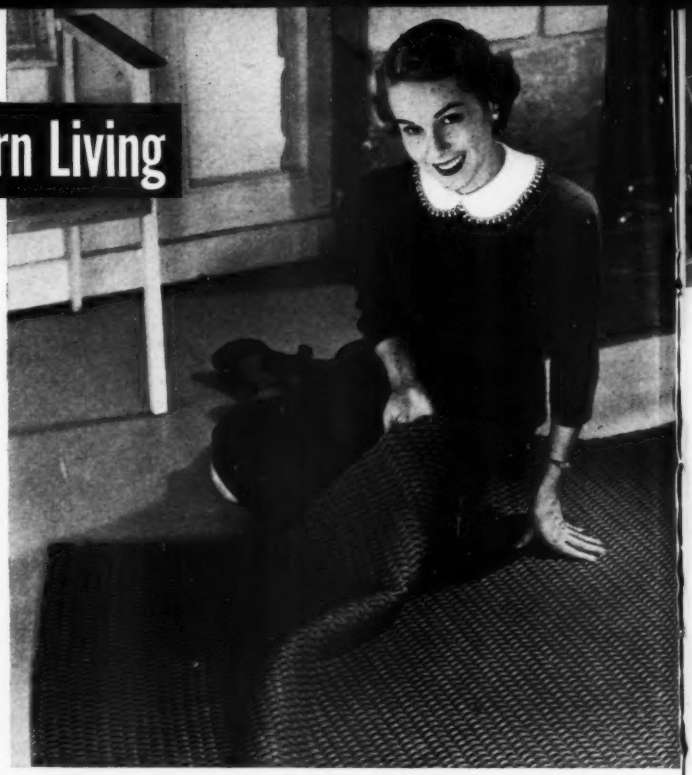
"Hey!" exclaimed the engineer. "Look!"

When you can surprise the guys who build them, that's the day! END

RANCH WAGON SPARE TIRE, carrying a bracket for jack, is concealed under floor. Locks on split door are regular car-door roller type.

SLIDING WINDOWS on Ranch Wagon open, close and lock with projecting thumb-operated latch mounted right on edge of glass.

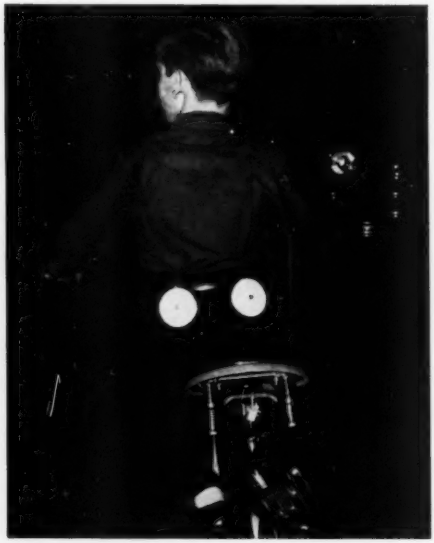
Aids to Modern Living



Rubber Rug Cushion. You walk on air when you walk on a rug laid over this padding of sponge rubber. Tiny domes molded into the rubber—384 to the square foot—make the pad a quarter of an inch high and add air pockets for resiliency.

The rubber pad has less weight and bulk than conventional cushions and won't pack down from heavy traffic. In a test a 12-ton steam roller passed over it 50 times but did not affect it, the maker reports.

Since the pad won't absorb dust, it cleans easily with vacuum or a damp cloth. *Sponge Rubber Products Co., Shelton, Conn.*



Safety Reflectors. Sealed in plastic, these Scotchlite disks clip to belt or collar and make after-dark cyclists or pedestrians visible for several hundred yards. *Automotive Safety Device Co., Hartford, Conn.*

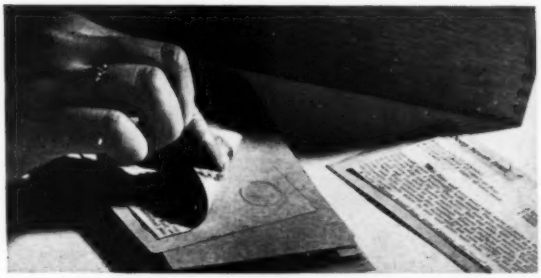
Roll Cutter. With this plastic gadget, rolls can be formed without touching the dough with the hands. Four blades on one side and three blades on reverse side shape "fan-tan" or clover-leaf rolls. *Kesco, Chicago.*

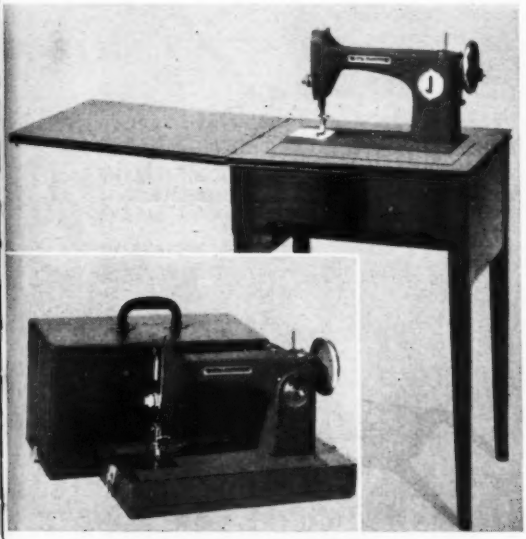
Slicer-Server. The stainless-steel blade of this spatula-knife has a curved, serrated edge. It cuts tomatoes cleanly without squeezing the juice out. *Hoffritz, New York City.*

Open-Handle Iron. Here's help for the hand that pushes the iron. This appliance, the result of tests to eliminate muscle strain and fatigue, fits the hand with an easy grip. *Westinghouse.*

Water Repellent. You can rainproof any nonrubberized fabric yourself with Raindri. The maker claims the spray won't stain or stiffen clothing. *The Goorin Co., Pittsburgh.*

Stick-Tacks. Stickum on both sides of these disks make them just what a collector needs to paste stamps or snapshots in albums, clippings in scrapbooks or pin-ups on walls. Artists use them to tack drawing paper to drafting boards, eliminating tack holes. They can be reused several times. *Thompson Winchester Co., Boston.*





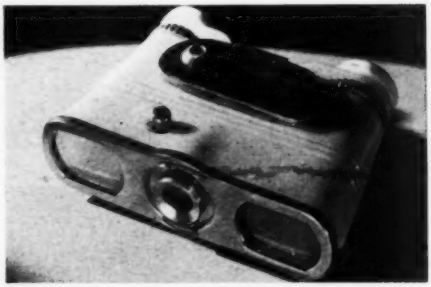
Low-Cost Sewing Machine. With the rotary gear drive of $300-plus machines—but no fancy trappings—this portable costs less than $100. Console is a bit more. *Free Sewing Machine Co., Beverly Hills, Calif.*

Hanging Shelves. Basement or attic shelves go up fast with these U-shaped steel supports. You just hook one into another, hang the lot from joists, then slide boards through. *Boschan & Bird, Philadelphia.*

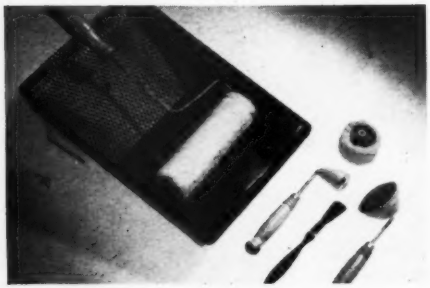
Please turn the page for more aids to modern living.

MORE Aids to Modern Living

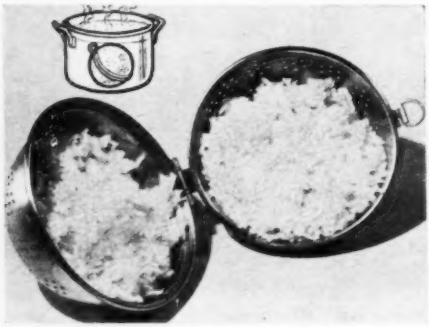
Heater-Light. This combination room heater and ceiling light won't scorch you on one side while you freeze on the other. A fan draws air from the ceiling level and forces it down over heating elements and into the room. *NuTone, Inc., Cincinnati.*



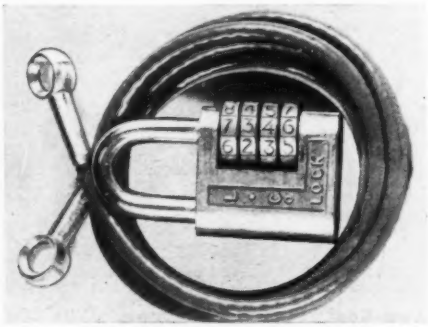
Camouflaged Camera. A tiny camera is built into these binoculars so that you are ready to snap fast action shots the moment you see them. *Random Corp., NYC.*



Painting Kit. You can roller-paint narrow corners and even sash and trim as well as wide wall areas with the four rollers in this kit. *Drum Corp., St. Clair Shores, Mich.*



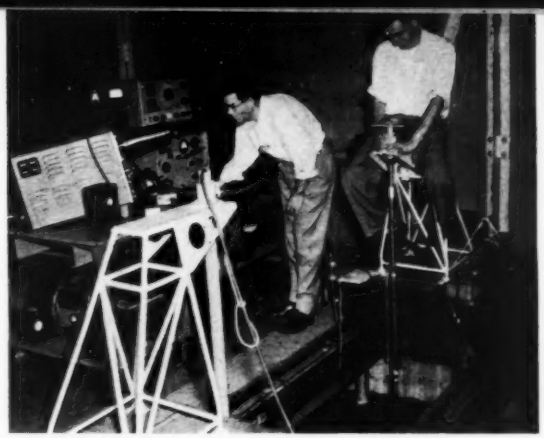
Rice Cooker. Rice cooked in this perforated aluminum ball can't burn and no steaming is necessary. Just lift the ball from the pot and it drains dry. *Elron, Chicago.*



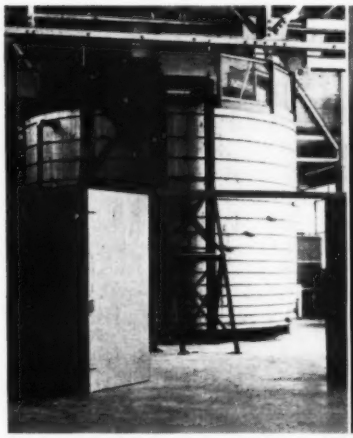
Keyless Padlock. The 36-inch steel cable on this lock makes it useful for protecting bikes, carriages, mowers or outboard motors. *Dawes Distributors, Cambridge, Mass.*

Ocean in a Tank Tests Sub Detectors

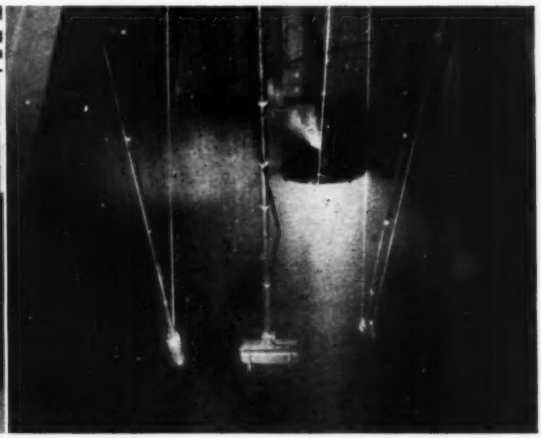
THERE's an ocean of water in the 35,000-gallon wooden tank below—as far as submarine-detecting devices are concerned. It is used principally for determining the sensitivity of Navy airborne sonar equipment. New hydrophones (underwater microphones) are submerged at one end of the tank. At the other end, a transducer (sound projector) is lowered to simulate the noise of a submarine.



DETECTION DEVICE is controlled by technician seated on "saddle" on tank-top platform. He turns it at various angles to sound projector hung from rack (foreground).



TANK holds 14-foot "ocean" for tests at Naval Air Development Center, Johnsville, Pa.



UNDERWATER VIEW shows sonar device being tested (center). At each side is a standard hydrophone, used for comparisons. Sound projector is at other end of tank.

"Pylons" for Jets Hold Extra Punch

THE hull-like units at left aren't midget battleships. They are "pylons" that will be suspended under the wings of Republic F-84 Thunderjet fighters to carry bombs, rockets or 230-gallon auxiliary fuel tanks. Designed by Westinghouse to meet the demands of increased speed of jet flight, they are filled with complex release mechanisms. A control system lets the pilot jettison the hitch-hiking loads or the pylons themselves.

Elastic Concrete

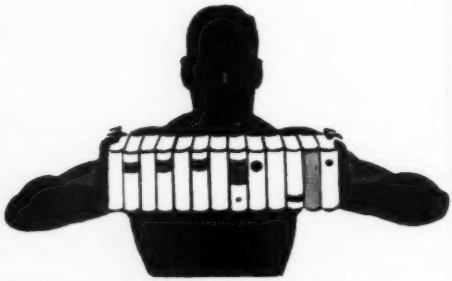
Graceful new bridge with 315-foot main span

THIS 16-FOOT "FISHPOLE," two inches square, is more flexible than wood—yet it's made of concrete. The secret is a taut "prestressing" wire inside, which makes ordinarily brittle concrete elastic and greatly increases its strength. Fishpole was made to show this by K. P. Billner, head of Vacuum Concrete, Inc., Philadelphia, and a pioneer in prestressing work.

A "FISHPOLE" two inches square and 16 feet long, that flexes with more whip than wood, has been made of about the unlikeliest thing imaginable—concrete. Running through its center, a stretched steel wire turns the brittle substance into a strong, elastic one. This demonstrates the principle of a building material that is helping to lick the steel shortage.

Its name is prestressed concrete. It consists of ordinary concrete held under a permanent "squeeze" by wires or bars under tension as high as 125,000 pounds to the square inch. Stronger than reinforced concrete, it reduces the bulk and weight of structural members, uses less cement, and takes only one-fourth as much steel.

These advantages, long known, can now be exploited. New laborsaving ways to make slabs and beams of prestressed concrete have opened virtually unlimited ap-



PRESSING BOOKS TOGETHER to lift all at once is simplest example of prestressing. Here it makes strong beam from material that has no tensile strength at all.

Pinch-Hits for Steel

of prestressed concrete, one of world's longest, crosses canal under construction in Germany.

plications for it. Today it is being used to build houses, bridges, silos, water tanks, railroad ties, aqueduct piping, transmission-line towers, roads and airport runways.

To see how prestressing strengthens concrete, consider a bridge girder. Its normal load bends it slightly downward. This compresses its upper side and stretches its lower side. So the girder must be strong enough not to be crushed or torn apart.

Prestressing Gives Structural Strength

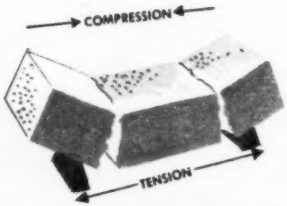
Push on ordinary concrete, and it is strong. Pull on it, however, and it easily cracks. It has little tensile strength—a glaring defect in a structural material—and would never do for a bridge girder.

Reinforced concrete would serve. Steel bars embedded in it provide the tensile strength that plain concrete lacks.

But prestressed concrete gets the same result in a more efficient way. Steel wires—say 256 of them, a quarter-inch thick—run lengthwise through a concrete girder and are anchored at one end. At the other end, a powerful jack stretches them. Still under tension, they are secured.

The girder now has a permanent built-in squeezing force, large enough to exceed any pulling force that will ever act on it. So a load can never subject the concrete to any tension at all. Its low tensile strength no longer matters. Lift a row of books all at once by pressing them together, and you apply the same principle—in this case, making a strong beam from objects lacking any tensile strength whatsoever.

Another way to make prestressed girders is by simply stringing concrete blocks on wires like beads, applying mortar, and then squeezing the blocks together. To make wall and roof slabs for houses, con-



ORDINARY CONCRETE, while well able to withstand a pushing force, lacks tensile strength to resist a pulling force. A beam made from it would easily break.

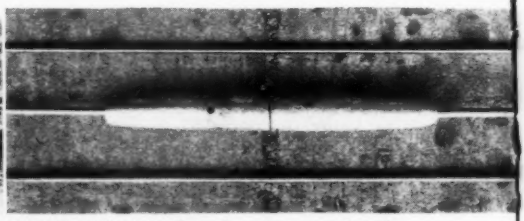
REINFORCED CONCRETE can serve structural purposes because steel bars, embedded in it and bonded to it, impart their high tensile strength to material. Hence it withstands tension.

PRESTRESSED CONCRETE gets same strength with less steel. Always compressed, it is never under tension. In best pattern for girder, some of wires are curved.

WATER TANKS

HUGE WATER-STORAGE TANKS, near Chester, Pa., are made of prestressed concrete. Group includes largest one ever built, holding 11,000,000 gallons.

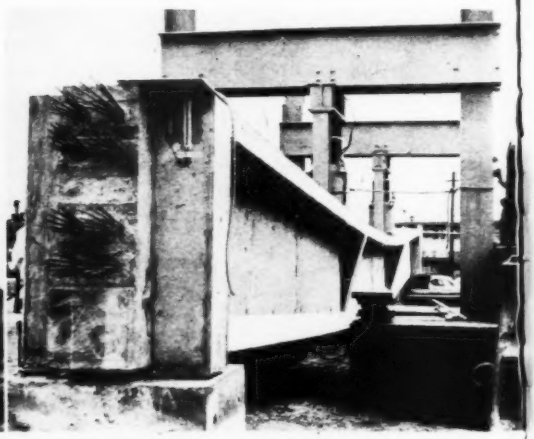
TO PRESTRESS TANK, self-propelled carriage rides around it at 11 m.p.h., paying out wire under tension from reel. Raising or lowering carriage gives wire right spacing.



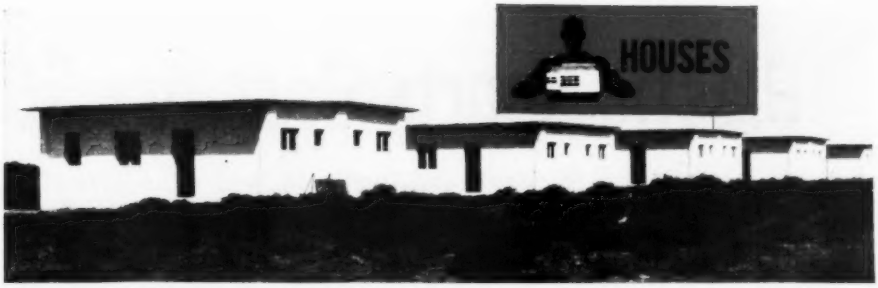
CONNECTORS join lengths of taut wire from successive reels. Loops get cross links, too, so whole winding cannot loosen if a wire breaks. Outer concrete layer then embeds wires.

BRIDGES

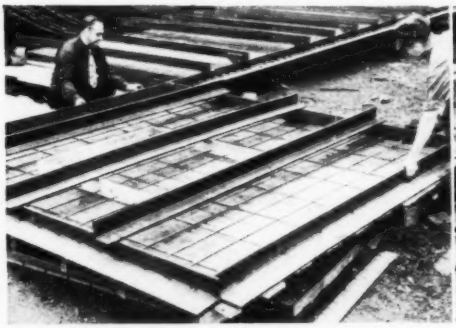
FIRST LARGE U.S. BRIDGE of prestressed concrete, Walnut Lane Memorial Bridge in Philadelphia, has 160-foot central span with four-lane roadway. Concrete girders contain wires stretched with jacks and anchored at ends. Weatherproof concrete buries anchorages.



TEST TO DESTRUCTION puts 22-inch bend in 60-foot girder of prestressed concrete before it breaks under load of 200,000 pounds—more than four times as much as it was designed to carry. Prestressed wires may be seen protruding at its near end.



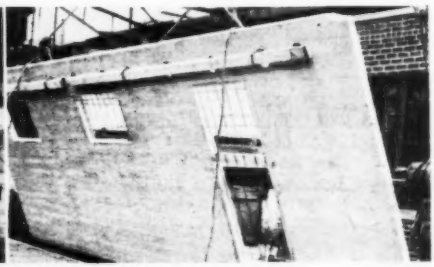
Low-cost homes of prestressed concrete like these in Israel will be built in U.S. as below.



PRESTRESSING WIRES run crisscross through holes in steel-angle forms for wall and roof slabs. Each ¼-inch steel wire has button holding one end, nut on thread at other.

HAND WRENCH tightens nut and stretches each wire in turn to desired tension of 120,000 pounds per square inch. Musical tone when wires are struck tells if their tension is equal.

FORM IS FILLED with concrete, then concrete-foam insulation. When they have set, buttons are cut off wires, nuts are removed from opposite ends and slab is freed from form.



WALL SLAB, four inches thick, is ready for erection. Openings will be cleared of wires. Dr. Jacob Feld, New York engineer, devised this prestressing method.

crete is poured around wires stretched on steel-angle frames.

Ingenious appliances and "hardware" aid in prestressing concrete. As if tying a knot while holding a finger on it, a double-acting jack devised by Eugene Freyssinet, French pioneer of modern prestressing, simultaneously stretches wires and drives home a conical plug to anchor them.

Girders with extensible ends and built-in jacks stretch their own wires in one of several new systems that are sponsored in the U.S. by the Preload Co. of New York. In another, alloy-steel bars replace wires. Tension of a jack stretches a one-inch-diameter bar an inch for every 25 feet of length. A special nut anchors it. This method will be used to build the longest bridge of prestressed concrete, a 17,500-foot structure at Tampa, Fla. END

Plastic Sports Cars Are 500

Light, tough, easy to repair and lovely to look at, plastic bodies

THERE may be a plastic car in your future. Take a look at these two custom roadsters, which have bodies of molded Plexiglas. Their builders claim several advantages for this type of construction:

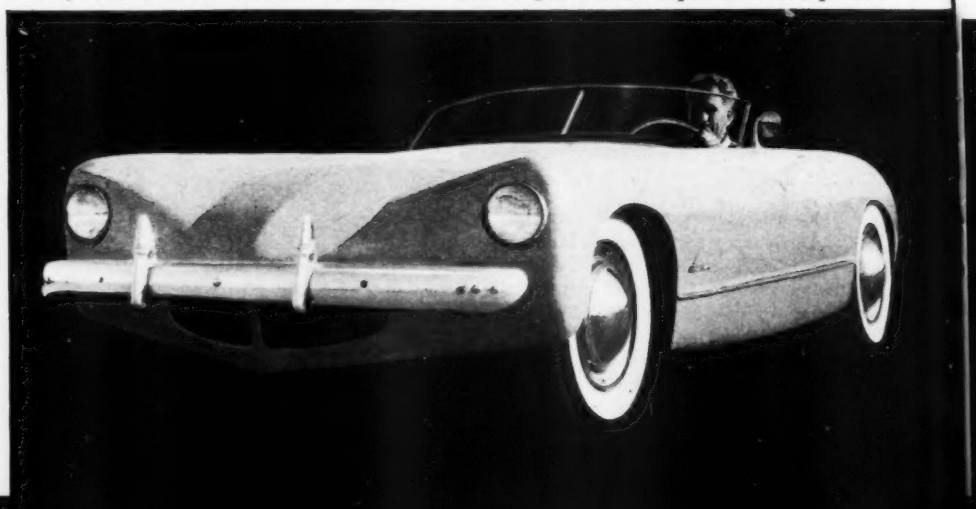
- An average saving of a quarter-ton in body weight lightens the load at the top—lowering the car's center of gravity and helping it hug the road.
- Use of lighter body material also decreases gas consumption and hops up performance, with the same horsepower and over-all car dimensions.
- Seamless construction enhances streamlining.
- Plastic skin is tough, yet easy to repair—you simply sand and fill in with the same material.

The body of the car pictured below was formed by laying three plies of Plexiglas over a plaster mold. Designed and built by owner Eric Irwin of Costa Mesa, Calif., the

INSTEAD OF LOWERING FRAME, Irwin removed X member and sits inside chassis. Seats are adjustable Fiat-Balila buckets. Instrument panel is from '40 Caddy.

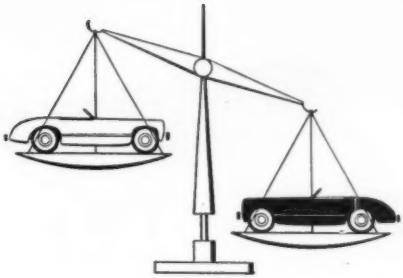
THREE LEVERS CONTROL gear shifting and overdrive. One on left is for low and reverse, middle is for second and high, right for overdrive. Upholstery is black leather.

CAR LOOKS LONG AND RAKISH yet wheelbase is only 110 inches. Modified Studebaker Champion 120-horsepower engine gives 26 miles a gallon at 35 m.p.h. Car can top 100.



Pounds Lighter

are a new idea in auto design.



body weighs 225 pounds, the car 2,220.

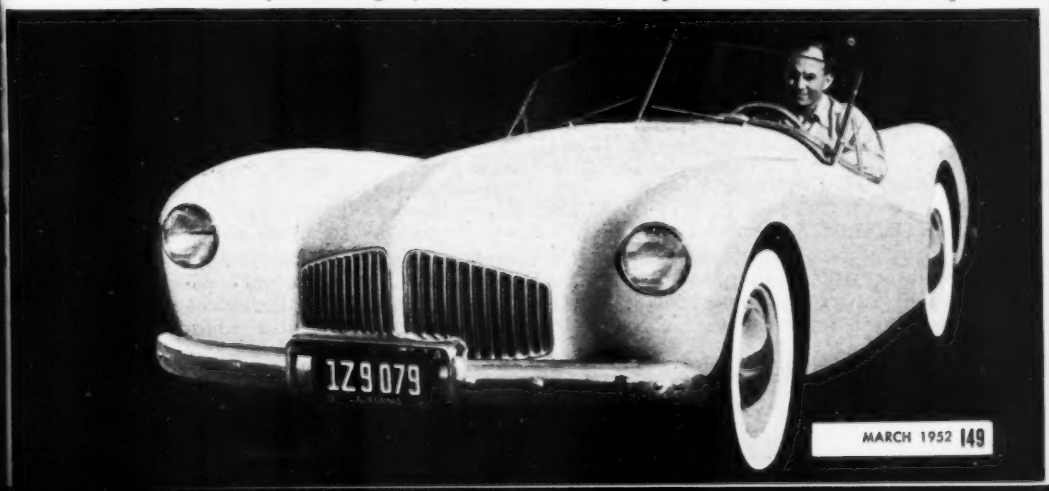
The flowing lines of the roadster on this page were similarly created from three layers of Plexiglas, but formed *inside* a plaster mold. Built by designer Bill Tritt for USAF Maj. Kenneth Brooks, the body scales 185 pounds—a tenth the car's total weight.

Both Irwin and Tritt plan to manufacture the plastic bodies. Irwin expects to market a plastic-bodied Ford chassis powered by a modified V-8. Tritt will supply bodies only.

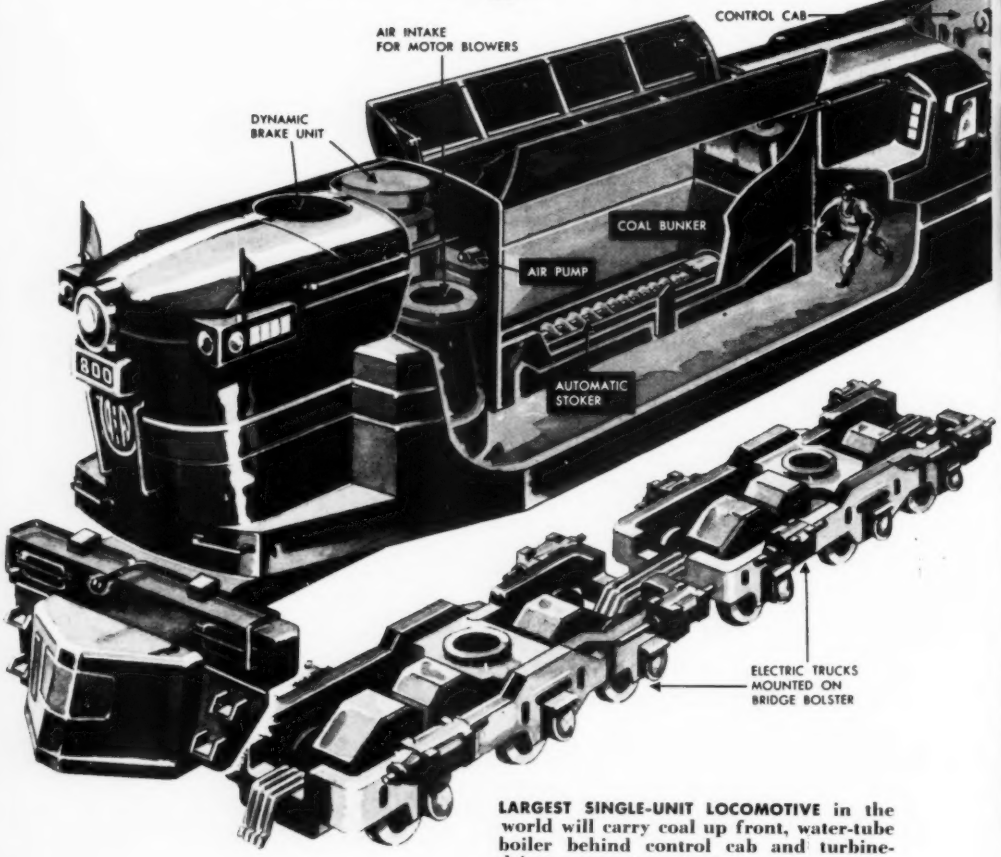
COMING OR GOING, Major Brooks' car is distinctive. Bumper comes from '49 Chevvy, tail lights from '50 Pontiac. Husky plastic skin is 3/16 inch thick.

HOOD PANEL LIFTS RIGHT OFF, providing easy access to engine. The power plant is a modified L-head four-cylinder '41 Willys with a 7.5-to-1 compression ratio.

SEAMLESS, ONE-PIECE DESIGN adds strength as well as beauty. Like engine, chassis is from '41 Willys, converted to a full box frame. Airplane shocks iron out bumps.



New *Coal Locomotive* Challenges Diesels

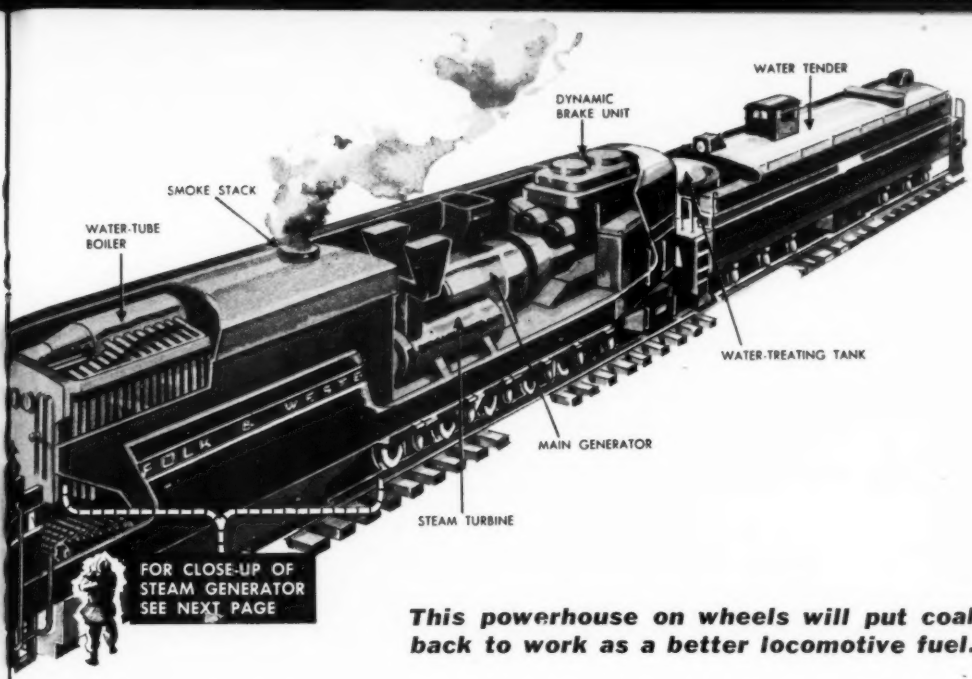


LARGEST SINGLE-UNIT LOCOMOTIVE in the world will carry coal up front, water-tube boiler behind control cab and turbine-driven generator at rear.

By Henry B. Comstock

SOMETIME next September, engine crews and technicians of the Norfolk & Western Railway will put the world's largest single-unit locomotive through its paces. Officially it will be classed as a coal-burning steam-turbine-electric. But already the men who roll America's heaviest tonnage up and down the coal-lined canyons of West Virginia are calling the coming giant "Jawn Henry."

The legendary Jawn is to railroading what Paul Bunyan is to the lumber industry and,



This powerhouse on wheels will put coal back to work as a better locomotive fuel.

like him, this black behemoth defies comparison. Measuring 161 feet between couplers, it will weigh in the neighborhood of 600 tons and develop 4,500 horsepower.

Up in the control compartment, engineers are going to find 110 years of traditional locomotive design thrown suddenly in reverse. The coal will be out front, stowed under hatches that open and close at the touch of a compressed-air valve. The boiler will be at their backs. Unbelievably, the steam-gauge hand will palsy at the 600-pound-per-square-inch mark. That is twice the pressure of today's huskiest engines.

To pour on the power, there will be no massive throttle arm, hinged from a bracket overhead. A trim controller stand is taking its place. As the stubby lever is eased into Number One notch, a silk-smooth surge of electric current will send Jawn Henry growling out of the yard with a mile and a half of heavily loaded hopper cars behind it.

Where does the *steam-turbine-electric* fit into the over-all motive-power picture?

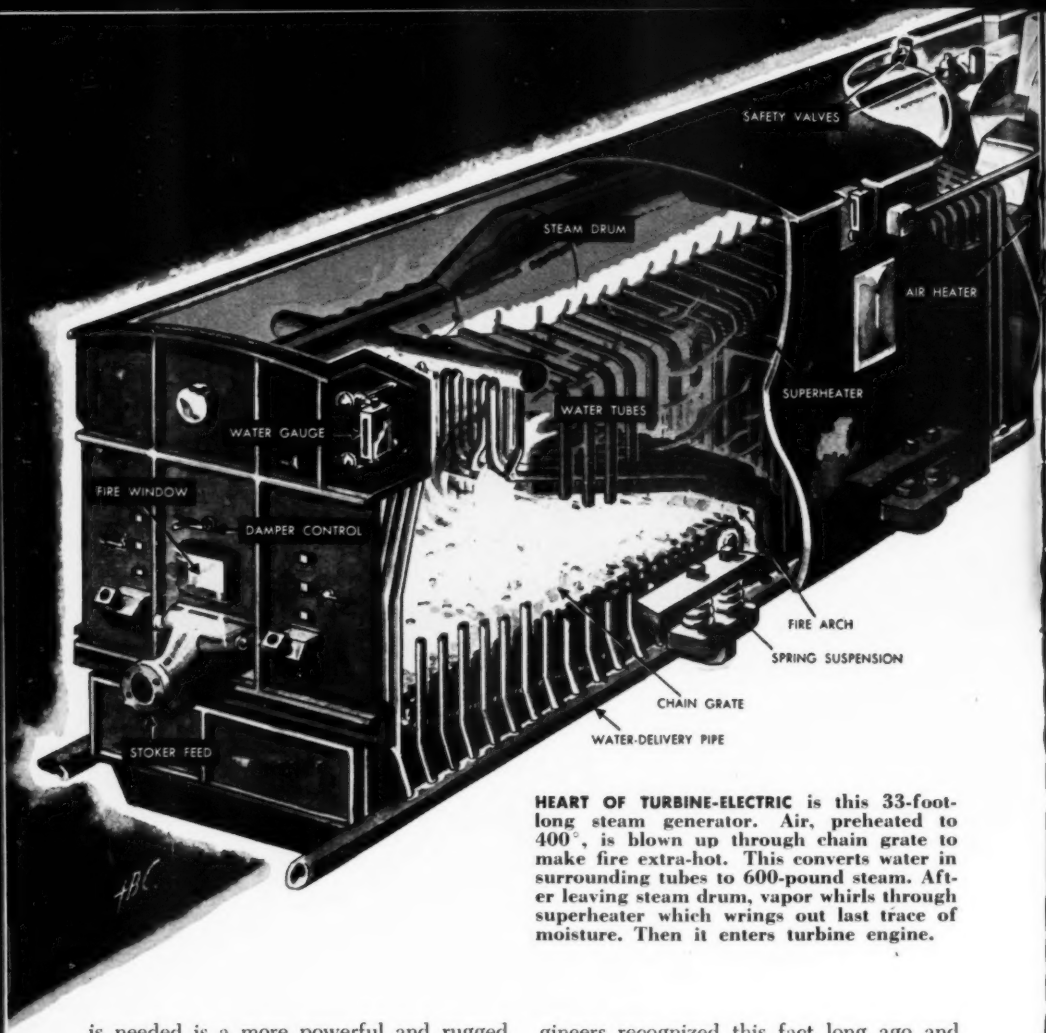
For years railroad men have known that electric drive was the ideal way to deliver power to the driving axle. It meant smooth operation and control. It gave an engineman the full output of his machine at starting, and dynamic braking to boot. It was easy on the rails, and shop crews liked its relatively light and standardized running gear.

But the cost of stringing thousands of miles of overhead wire before a single electric locomotive could glide off with a payload scared customers back to the roundhouse. Then the Diesel honked onto the scene, hauling its own generating plant. As a self-propelled machine, it has been selling nationwide electrification on the installment plan.

Diesels Require Costly Duplication

Unfortunately the "carrying charge" is high. Even the largest Diesel engines which can be crowded into a single cab have a relatively small horsepower rating. As a result, a road locomotive may be made up of as many as four units, presenting a costly duplication of equipment. What

When the crossing lights start blinking for this giant, you might as well cut your ignition and count cars. To find how many cars the locomotive can haul, start with border below and keep going till you come to the caboose . . .



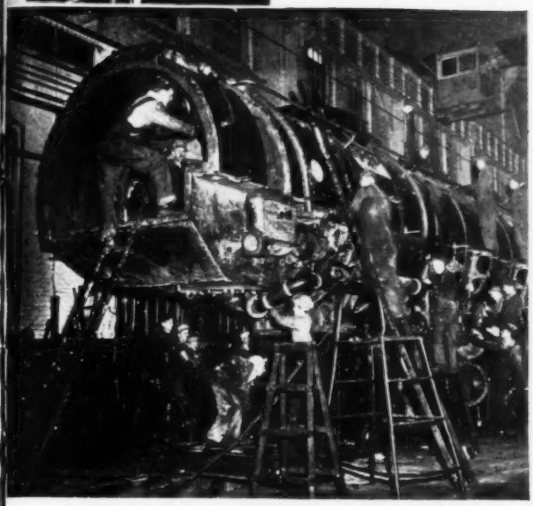
HEART OF TURBINE-ELECTRIC is this 33-foot-long steam generator. Air, preheated to 400°, is blown up through chain grate to make fire extra-hot. This converts water in surrounding tubes to 600-pound steam. After leaving steam drum, vapor whirls through superheater which wrings out last trace of moisture. Then it enters turbine engine.

is needed is a more powerful and rugged engine—one which can drive a larger generator and boost the performance of a single locomotive unit.

Norfolk & Western officials believe that this giant of theirs will have that engine. But they are not going out on a limb with superlative claims. They know that every other steam-turbine locomotive built to date has long since been cut up for scrap. They are also convinced that they know the reason why. The trouble, they say, has nothing to do with the turbine itself. The big problem is to design the right steam generator. No conventional engine boiler can satisfy the turbine's greedy appetite without running up prohibitive fuel costs. Marine engineers recognized this fact long ago and turned to high-pressure flash- and water-tube jobs. They work to perfection in a ship's hull. But out on the railroads, track shocks and the skewing action of an engine frame can turn the best seagoing boiler into a mass of leaking tubes and crumbling fire clay.

Working with Babcock & Wilcox engineers, N & W has analyzed these damaging stresses, discarded the flash-boiler design, and come up with a water-tube steam generator. This 33-foot-long unit is now under test and gives every indication of having what it takes to stand the gaff.

There will be nothing complicated about the operation of either the boiler or the



NORFOLK & WESTERN ROLLS ITS OWN. Roanoke, Va., shop gang here applies final fittings to "A" Class boiler before covering it with asbestos insulation.

ENGINES SERVING THREE DIVISIONS are dispatched from Shaffers Crossing terminal, west of Roanoke. Ducts, seen on roofs of servicing sheds, carry off smoke.

locomotive. Coal, fed from the hoppers in the engine's prow, will be carried under the control compartment by an automatic stoker and spread thinly onto a chain grate in the steam generator's fire chamber. There, under controlled forced draft, it will supply the intense fire needed to convert huge quantities of specially treated water into 600-pound steam. Practically the last trace of moisture will be wrung from this steam in a high-capacity superheater before it is poured into the single, eight-foot-long turbine used to power the main and auxiliary generators. Their electric output—enough to supply the lighting, heating and power needs of a fair-sized town—goes to 12 traction motors geared to the driving axles.

Motors Also Act as Brakes

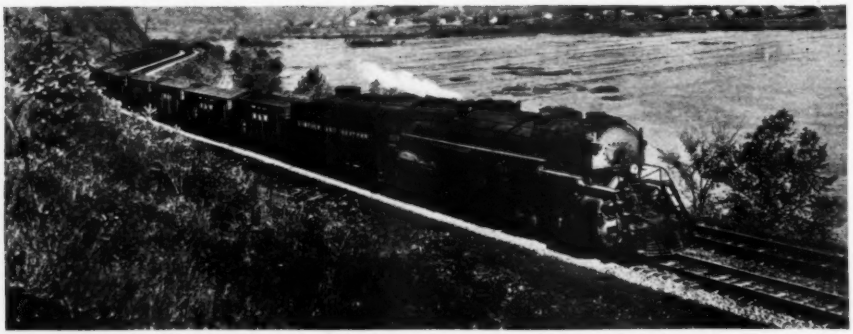
On the long downgrades the engineer can, with the flip of a switch, convert the driving motors into hard-working generators whose combined drag will hold the speed of his train to a crawl, without the touch of a brake shoe. Naturally the current produced in this way must be dissipated. So two giant grids—coils of resistor wire—are to be placed under the roof of the cab, and vents will carry off the heat.

The Norfolk & Western has some mighty big turntables, but none long enough to handle this big revenue hauler. With that in mind, quick-coupling hose connections are to be installed between the locomotive and its double-ended tender. These will allow roundhouse crews to drop off the tank, give the engine a spin, and tie it on again in less time than it takes a Diesel crew to walk around a four-unit job.

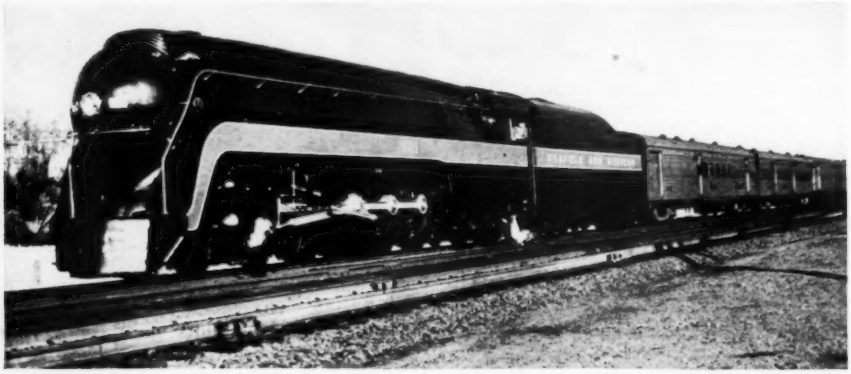
Old King Coal May Reign Again

Back of this whole design is something bigger than a single locomotive. Like the coal-burning gas turbine which the N & W, eight other railroads, five coal companies and Bituminous Coal Research are co-sponsoring, it is an attempt to put Old King Coal back on his railroad throne. Work on the gas turbine has been slow, mainly because of the difficulty of preventing erosion—the pitting of rotor blades by microscopic particles of fly ash hurled against them at high temperatures and supersonic speeds. But an experimental engine of this type, run on the blocks for 200 continuous hours recently, is said to have stood up under fire like a General Patton tank.

If either of the bituminous-burning loco-



Huge forward cylinders of Y-6s make these engines the most powerful on flanged wheels.



No Diesels allowed! N & W uses its mighty Js to haul Southern Railway's crack Tennessean.

motives lives up to expectations, it will be more than a match for the Diesel. What is more important, it should duplicate the performance of another newcomer in the locomotive field—the *oil*-fired gas turbine.

That being the case, tomorrow's buyer might even manage a faint smile as he shells out half a million dollars for one of these advanced coal burners. For as much as he likes his shiny new Diesels, he isn't particularly happy about biting the hand that feeds him, and he has been doing just that for some time now. Last year one dollar out of every seven earned by American railroads came from hauling bituminous coal. During the same 12 months, as a direct result of the switch to Diesels, the amount of coal bought for steam locomotives was less than half that in 1943.

Fortunately for the mine interests, greater steelmaking demands and heavy export sales have taken up the slack. But there has been more than a little grumbling down in the soft-coal country. Now that they are on the short end of a hundred-year-old partnership, many operators are looking with favor on overland conveyor belts. As one of them puts it:

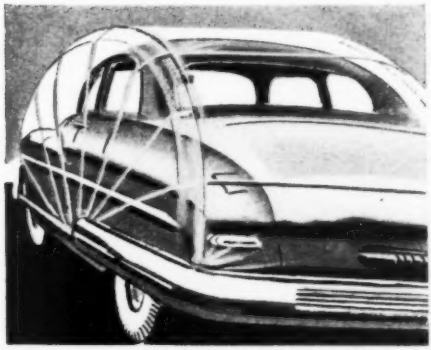
"It would make a lot more sense for us to use such a system, powered by coal-generated electricity, than it does for the railroads to buy fuel oil pumped to them through the pipe lines which put their tank cars out of business."

Norfolk & Western isn't concerned over such threats to railroad transportation. As a champion of super steam locomotives, and the only Class One railroad in the United States which does not own a single Diesel unit, it has become a knight in shining boiler plate to both the coal

[*Continued on page 252*]

I'd like to see them make . . .

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



AN AUTOMATIC COLLAPSIBLE GARAGE. A plastic cover, folded into large rear bumper, would be motor-driven up over car to lock into front bumper.—*R. Rechter, Ferndale, N. Y.*

A THIRD KITCHEN-FAUCET VALVE, in "mixed" portion of unit, to permit turning water on or off without readjusting hot and cold taps.—*J. W. Carmichael, Jr., Los Angeles.*

A FLEXIBLE FLASH-GUN BRACKET that would allow the flash gun to be set in various positions while still attached to the camera.—*Jack Lloyd, Los Angeles.*

A METER ON A TELEPHONE to count outgoing calls, so that you would know, at any time through the month, how many had been made.—*A. S. Flaumenhaft, Brooklyn.*

WINDOW SCREENS THAT OPEN OUTWARD from the center on hinges, like shutters, to facilitate window washing. — *Elizabeth Shafer, Colorado Springs, Colo.*

Britain Tries Windmill Power

THE winds that sweep the British Isles are being tested as a source of electricity. Experimental windmill generators have been built on the Welsh coast and in the Orkney Islands. The streamlined job shown above goes into action in the lightest breeze but is rugged enough to work undamaged in a strong gale.

Outside Spare for Henry J

A SNAP of the wrist unhooks the spare from this carrier, designed as an accessory for the Henry J. It can be mounted on models with or without deck lids and is reported to increase the car's luggage capacity by 20 percent. The "Continental"-style accessory is sold by Kaiser-Frazer dealers.

Tape Records Earth's Grumbles

WHAT does an earthquake sound like? Well, a local shock sounds like a pistol shot and a distant quake like a ten-strike in a bowling alley—when you hear them played back on the magnetic-tape machine above.

Prof. Hugo Benioff of Caltech developed the device not to listen to earthquakes but to measure their energies. His recorder does that simpler and faster than other instruments. It picks up small electric currents generated when earth vibrations affect a pendulum seismograph. The machine is so sensitive it can detect compressors operating in an ice plant on the other side of town.

COLONIAL above is same four-bedroom prefab as house at left—plus porch, chimney.

Prefabs Can Look Like Other Houses

Imagination will remove that factory-made appearance —and you can do much of the work yourself bit by bit.

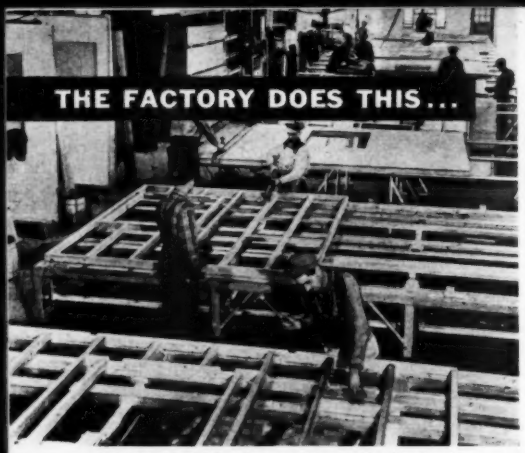
By Robert Lasch

THE man who wants a really individual house—one that's built for him alone—yet wants to duck the cost of a regular custom job, has a tough row to hoe.

If he acts as his own contractor, he has a host of headaches and still finds labor costs eating half or more of his money. If he tries to do most of his own work, the job may drag out for months, perhaps years.

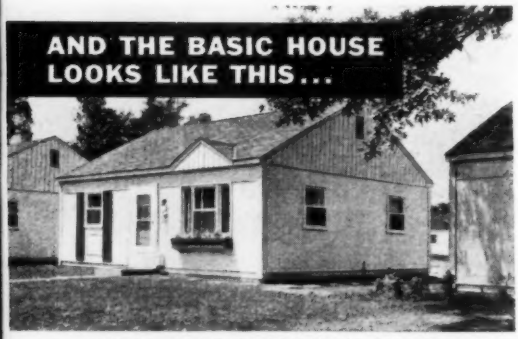
But there is a way to beat the game. It is to delegate basic construction to a factory and either do the finishing, trimming and extra touches yourself or have a builder do them piecemeal as you can afford them. When you're through with a prefabricated house, it can have just as much of a custom look as Mrs. Gotrock's $50,000 special over in Millionaire Manor.

Prefabs—without individual trimmings—cost less because factory machines and assembly lines cut the labor costs that are a major expense in on-the-site construction. Most conventional builders



MAJOR PARTS of prefab are built in factory. View above in National plant shows start of panels in foreground, completion in background. Time: about 24 minutes.

HOUSE IS ASSEMBLED on site by dealer. Photo shows how it goes together. Roof panels are being notched into rafters of ceiling panels. Roof will be trussed and braced inside later.



TWO-BEDROOM PREFAB looks like this when erected. Exterior is marine plywood. House, 24 by 28 feet, costs from $7,000 to $9,500 depending on land, transportation costs.

figure that 40 to 50 percent of their costs will be labor. A prefabricator doing a volume business spends only about 15 percent for labor.

The labor cost of assembling a prefab on the site runs one-fourth to one-third of that for a conventional house. Six men can erect a two-bedroom prefab, after the foundation has been laid, in one working day. Plumbing connections, wiring, trim and other on-site operations can be completed in a week or 10 days.

You Add the Extras

At this point you have a home you can move into. When you have survived the financial shock of the down payment, you can begin to add, at leisure, the things that will make the house a distinctive home of your own—cedar shakes or redwood siding on the exterior walls, a porch or breezeway and garage, built-in furniture, paint or wallpaper, a breakfast bar, parquet flooring and so on to the limit of your pocketbook and imagination.

This combination of prefab cake and custom frosting may offer advantages, too, in financing. Nobody will lend money for a house that may, or may not, be finished next year. The moneylenders have to be satisfied that if death, divorce or disaster knocks out the original owner they will have a house that somebody else will buy.

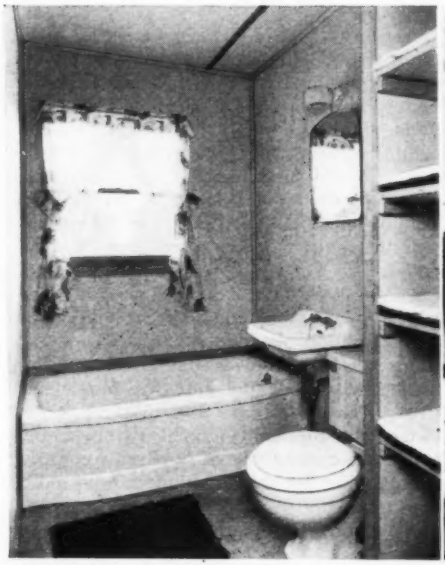
Sound prefabs that meet the requirements of the FHA and Veterans Administration are being built now. Each house is a finished job when the prefab dealer is through with it, and so can qualify for a loan. The individual then can take up where the prefabricator leaves off. He will, of course, need the consent of the mortgage holder for major changes, but no lender is likely to object to a project that increases the value of the house.

A House Every 30 Minutes

Prefabrication has had its ups and downs, with spectacular fiascoes like Lustron and smaller failures among the many manufacturers who rushed into the field. But manufacturers who have survived the rocky first years of the infant industry now are producing quite creditable houses at costs that compare favorably with conventional methods, and they often decidedly undersell competitors where the distance from the factory, local building codes and labor conditions are favorable.

HERE'S WHAT YOU CAN DO...

TO UTILITY ROOM Here's utility room in prefab when the builder is through (left above). Furnace is in right background. Same room after owner customized it is shown at right above. Automatic washer replaces laundry tub; furnace and hot-water heater are enclosed; wall cabinets, shelves, counter have been added.



TO BATH The basic bathroom that comes with a prefab house looks like one at left above. Walls, like all in a National house, are wallboard, as is ceiling. At right above is what one prefab owner did to a similar bathroom. Wainscoting is Marlite, wallboard above has been covered with washable wallpaper. Shelves have been enclosed.

The largest manufacturer now in the field is the National Homes Corp., with plants at Lafayette, Ind., and Horseheads, N. Y. Jim and George Price, Lafayette real-estate men, started National Homes 11 years ago with $12,500 capital. Today it is a $13,000,000 corporation doing $30,000,000 worth of business a year.

This company produces 11,000 houses a year, one-third of the industry's total output, and is still expanding. A complete house rolls out of its parent plant at Lafayette, during peak production periods, every 30 minutes.

These homes range from a 24-by-28-foot two-bedroom "thrift home" to a 48-foot four-bedroom job that becomes quite fancy when prettied up with a glassed-in breeze-

way and garage. The smallest house is built to sell for about $7,000, lot included, in small or medium-sized communities within 500 miles of the plants. It can be bought for $1,000 down with an FHA loan, or $300 down with a Veterans Administration GI loan. The largest house, without such extras as garages and breezeways, is built to sell for about $12,000.

Houses Come as Kits

The prices vary with local markets. A two-bedroom house sells for $9,350 in St. Louis and for even more in the Chicago area. Higher land costs, higher labor costs and the general state of the metropolitan market account for the difference.

The house as it comes from the factory—the shell panels plus wall furnace, bathroom and kitchen equipment, doors, windows, trim and all the basic parts—costs the dealer about $3,000.

He is responsible for developing the lot, making utility connections, laying an insulated concrete slab or digging a basement. And he pays for the erecting and finishing crew, installing plumbing and wiring, landscaping, roofing, painting. If the buyer can persuade the dealer and lender to let him do some of these jobs himself, he can cut the delivered price by that much.

Mechanical Carpenters Speed Assembly

Anybody who has watched the slow progress of conventional house building will be flabbergasted by the speed of a prefab factory. All lumber is precut to measure and assembled on huge metal jig-tables. Crews of eight to 10 men work at each station. Preset jaws tell them where to place each stud without measuring.

Every process that can be mechanized is mechanized. Door jambs, for example, are cut and finished in quantity. Before being assembled, they whip through machines that mortise the lock openings, cut the hinge routings, drill holes for the screws and finally screw on the hinges. Each type of panel—wall, ceiling, roof—has its own assembly line, and the assembly lines merge at the loading dock. A 10-ton truck then carries away everything that goes into the house.

Very little of the "prefab look" marks the finished house. Interior walls are covered with fiberboard sheets up to 20 feet long. Except in the longest living rooms there are no seams. The wallboard can be painted, papered or left in its natural eggshell finish. Or, you can easily nail plywood paneling over it.

Panels Stressed Like Airplane Wing

Corners are trimmed with molding, floor joints with a three-inch baseboard. Ceilings are of gypsum plasterboard, finished at the factory with sand paint, in panels four feet wide. The faint seam that shows between ceiling panels is not objectionable.

When the house stands on a concrete slab, the floors are usually finished in asphalt tile. FHA regulations in some communities permit a plain concrete floor, in which case the owner can install his own flooring later. In basement houses, the usual finish is standard oak flooring or asphalt tile on plywood subflooring.

The panels themselves, put together at the factory with nails and glue, are tough and strong. Exteriors have two-by-three studs instead of the conventional two-by-fours, and interior panels have two-by-twos. Any strength lost by shaving the studs is more than made up by the ⅜" plywood sheet outside and the fiberboard sheet inside. These

[*Continued on page 250*]

YOU HAVE SEEN THIS HOUSE BEFORE—it's another variation on basic four-bedroom prefab shown on opening page. Double garage continues roof line to give ranch-house look.

Keeping the Home Shipshape

WHEN PAPER STICKS to furniture, a few drops of oil help to loosen it without harming the finish. After the oil has soaked in, the paper can be rubbed off with a cloth.

A METAL VEGETABLE BIN makes a good catch-all for the small toys that are always underfoot. It takes up little space and is light enough to carry from one room to another.

A SLIPPER HOLDER that is useful at the side of a high hospital bed is made by bending the shoulders of a wire hanger inward toward the center of the crossbar, then slightly upward.

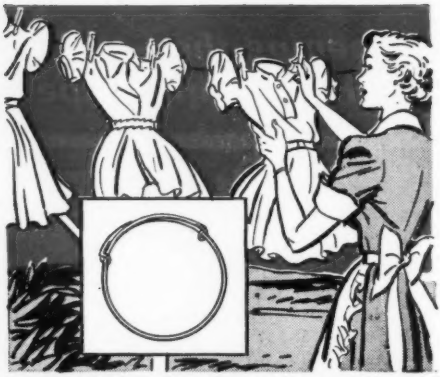
SQUEAKING FOOD GRINDERS, egg beaters and electric mixers can be oiled safely with mineral oil or glycerin. If such lubricants get into the food, they won't harm it.

A WIDE STEP like this on a runged ladder is easier on the feet. L-shaped iron straps are bent to fit over the rungs. Holes in upper arms allow step to hang level.

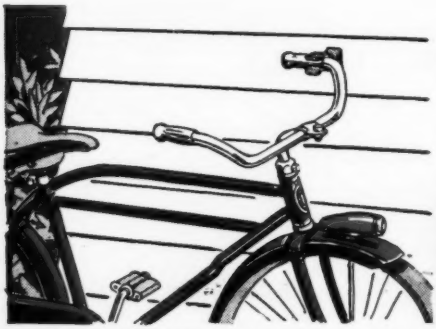
Please turn the page for five more suggestions.

Keeping the Home Shipshape

AN UNTHREADED CAN COVER will lift off easier if adhesive tape is wrapped around the rim. Even when hands are wet or sticky from preparing food, a good grip is assured.



PUFFED SLEEVES dry faster if stretched with rings of 1/16″ bronze brazing wire. The rings compress into small circles for insertion, spring back when released in the sleeve.



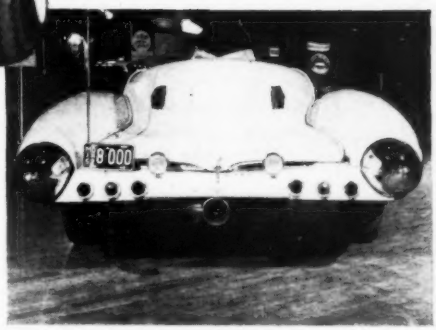
A NEAT BICYCLE RACK for indoor or outdoor use is simply a tool clip attached to a wall of the house. Clamp the handle bar in the clip and the bike will stand upright.

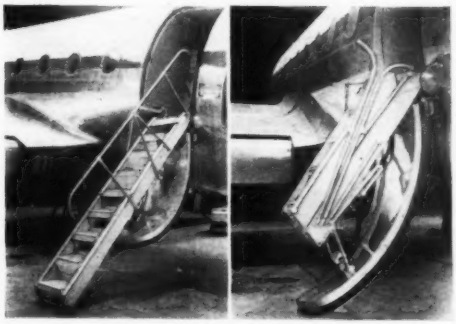
CLEANING A TYPEWRITER with brush and cloth is a messy, lengthy chore. Try using the long-nosed attachment on a vacuum cleaner. It does a more efficient job and does it faster.

ALUMINUM TRIM used on kitchen sinks and cabinets sometimes forms an oxide coating that may blacken the apron of a housewife who brushes against it. The problem can be solved by rubbing the trim with steel wool to remove the oxide film and restore original brightness, then sealing with two coats of white shellac or clear lacquer.

Tricycle Car Hits 110

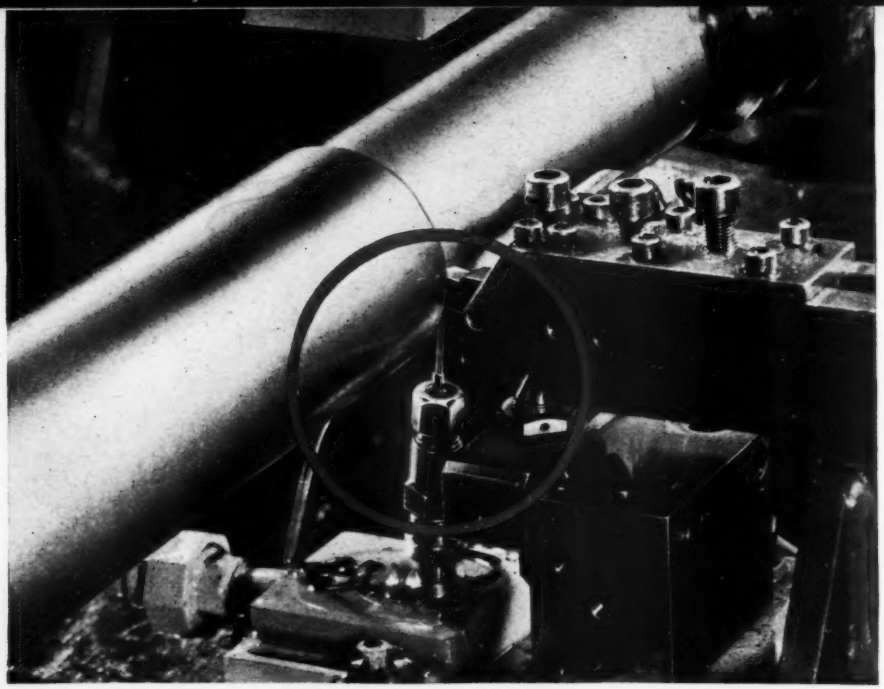
THIS ground-hugging, three-wheeled sports car was exhibited recently at the International Motor Show, Washington, D.C. It was built by Richard Harp of Boonsboro, Md. An airplane belly tank forms the front of the car (above) and two wing-tip tanks serve as fenders (shown in rear view at right). Powered by a 75-horsepower Lycoming aircraft engine, the car zooms along at 110 miles an hour. Italian, French, German, British and American cars were exhibited at the $1,000,000 show.





VIPs Get Special Planes

THE folding stairway at left extends and retracts as the plane door opens and closes. It is part of the equipment on four special Handley Page Hastings planes that the RAF Transport Command will use to carry "very important persons." The rear cabin of these planes—painted white on top to keep them cooler—accommodates four VIPs. The central cabin, a conference and dining room by day, converts to sleeping quarters at night. Forward is a cabin with eight seats.



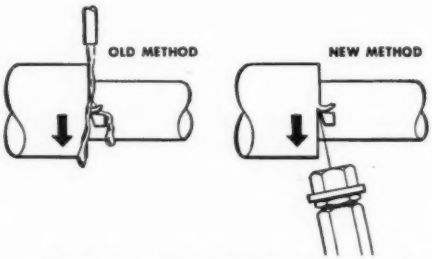
HI-JET AT WORK. Jets of oil .0001 inch in diameter spurt up from special nozzle to hit the sharp edge of a lathe tool. Oil vaporizes and gets between tool and work, thus cooling and lubricating at point where high cutting pressure usually burns tool out fast.

Shooting New Life into Cutting Tools

The Hi-Jet fires high-speed streams of special coolant at the cutting edge and makes it last many times longer.

UPSIDE-DOWN cooling of lathe tools now makes them last longer and cut faster. Ordinarily a machinist lets cooling oil drip down on the point where his tool bites into the work. A new method called Hi-Jet squirts the oil up under high pressure so that it hits the cutting edge underneath the chip. High-speed tools then last six to 12 times longer, carbide tools three to five times longer, and cutting speeds can be doubled.

The secret of Hi-Jet's remarkable success is that the stream of oil vaporizes as it hits the target. The vapor swishes over the nose of the tool and condenses in tiny passages in both the cutting edge and the material being cut. In vaporizing, the oil picks up a lot of heat from the cutting edge. More heat is removed by excess oil from the jet, which runs back down the heel of the tool. Lubrication and cooling together preserve the tool's normally short-lived nose.



STEEL CHIP FORMS AN UMBRELLA over nose of a cutting tool. Overhead low-pressure oil bath (left above) largely runs off the umbrella. Hi-Jet (right above) gets under it.

Hi-Jet, invented by R. J. S. Pigott, head of Gulf Oil's Research & Development Co., is at present intended mainly for lathes and vertical boring mills but can be adapted to other machine tools. The complete unit consists of nozzle, flexible tubing and a small pump. Gulf makes a special oil for it.

He Invents Paper Boxes

Richard Paige, self-taught engineer, makes folding money by folding cardboard.

By Wesley S. Griswold
PS PHOTOS BY HUBERT LUCKETT

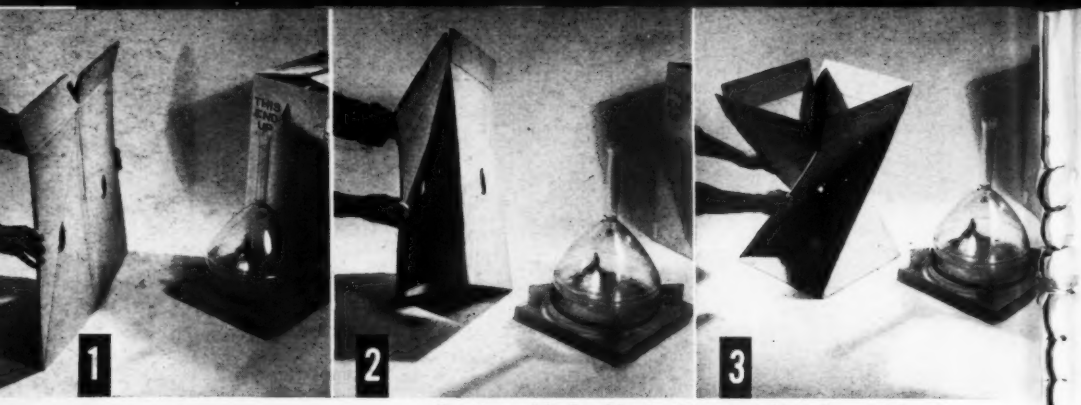
A FORMER saxophone player is now calling the tunes for the huge paper-box industry.

Richard E. Paige, a tall, big-framed, graying New Yorker of 47, who used to tootle the nights away in smoky Greenwich Village dine-and-dance spots, has become one of the country's leading "cardboard engineers." What he actually does is invent new uses for corrugated board and cardboard. He has come up with a good many.

The most novel products of his imagination, however, are the extraordinary boxes pictured with this article. They're best-sellers. They not only look different from other boxes but are stronger and cheaper, require fewer manufacturing operations, and practically assemble themselves.

Paige, who is self-taught, has been a designer of cardboard window displays for years. He developed and patented seven brand-new ways of folding cardboard. Designing window dis-

ON A CARDBOARD PEDESTAL, this 114-pound girl can't believe she's safe. Paige, beside her, knows the structure—his TV-tube holder—will support even more weight.



ASSEMBLING PAIGE'S TELEVISION BOX

Starting with flat blank (1), assembler first pushes in on outside edges. Half nearest camera folds inward at middle, along diagonal score line (2). Next, by simultaneously pushing with right hand and pulling with left,

plays is still 50 percent of his business. But "pushing back the frontiers in corrugated," as he describes his latest endeavors, is fast gobbling up the remaining 50 percent. It evidently is a well paying kind of inventing. Paige and his wife live in a stunning modernistic penthouse overlooking the East River.

Husband and Wife Form Team

In 1940, Paige had the rare and pleasant experience of being offered a year's business in advance by regular customers just to sit back and invent. He rounded up some other designers, taught them his methods and formed Richard E. Paige, Inc., the only independent group of cardboard engineers in the country. (The rest work for box or display makers.)

Mrs. Paige, a short, slim woman of great charm, who enjoys selling boxes as much as baking apple pies, decided that her husband's unusual designs needed unusual salesmen. With his consent, she formed a separate concern, the Paige Co., and took over the merchandising of his designs, leaving his mind clear to consider the possibilities of corrugated board.

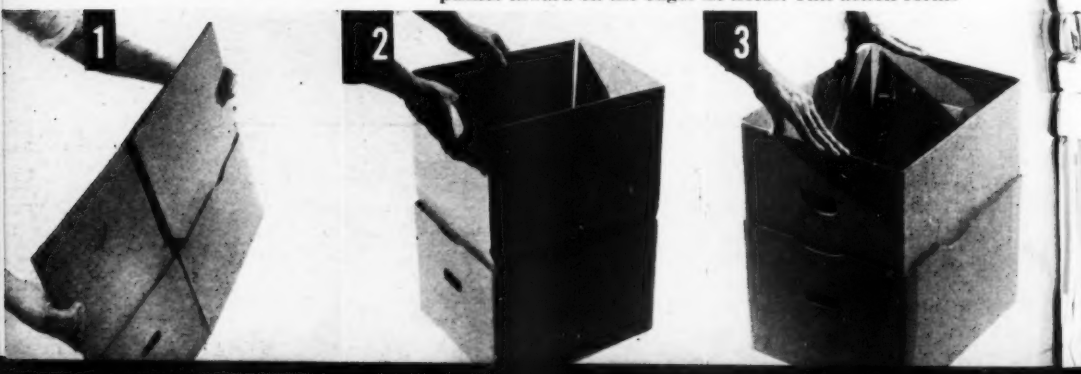
Paige's main attack on the frontiers in corrugated is two-pronged. One consists of a drive to simplify or wipe out expensive manufacturing operations. The other is an intensive effort to make the handling of the product as nearly automatic as possible. Most paper boxes are assembled one panel at a time. Paige's go together almost instantaneously, with "teams of scores"—score lines that make the cardboard bend in the right places—ingeniously working in unison. And their interlocking structure increases their strength.

Miracle Box Works Like Magic

Paige's Miracle Box is a spectacular demonstration of what his designing technique accomplishes. It was created on request to supply a client with a simpler, stronger and cheaper double-wall, double-floor box in which to ship apples. Its predecessor had 16 large, floppy parts. The

ASSEMBLING PAIGE'S "MIRACLE BOX"

This box, which is actually two made out of one piece of cardboard, is flat to start with (1). The top half is of single thickness, the bottom half double. Assembler first pushes inward on the edges he holds. This action forms



assembler causes both halves of blank to fold diagonally, instantly creating Z-shaped tube container (3). This is then placed in plain cardboard box (4). Flaps at top of tube holder form socket for cover. TV tube is set in its container (5), which has center hole for tube's long stem. The cover (6), with prongs to hold tube's head, is then inserted.

Paige box has two parts: container and cover. The container looks like an ordinary rectangular tube, but when you push down on it, the panels slide over each other in a magical sort of way and in two seconds you have a double-wall, double-floor box that can and does compete with wood. The cover tucks into the space between the walls of the box and has no extending edges. It can be opened and closed many times and never needs sealing.

Neat and extremely sturdy, this box ships both apples and tomatoes. And because it can be collapsed with a single pull for easy return when empty, many shippers have reused it several times. This cuts its cost to a fraction of what a one-journey box for the purpose would cost. With Mrs. Paige's gift for merchandising, the same box has found a shining future in a far different field. The City of New York has decided to use it exclusively for shipping and storing its archives, which date back to the days of the first Dutch settlement on Manhattan Island. The Miracle Box is not only strong enough for this important job, it protects records from fire better than a steel box does. In tests, the corrugated walls charred but kept the contents of the box intact. Papers inside a steel box put to the same test were baked to an unrecognizable crisp.

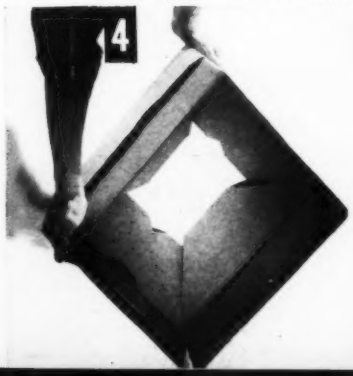
Inventors Never Say Die

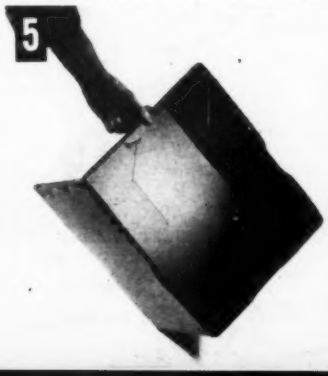
The field thus opening up for the Miracle Box is vast. Nearly every business and government agency has to keep masses of bills, old letters and legal papers. The Veterans Administration alone must store 62 solid miles of records every year.

Inventors should never say die, Paige insists. If one prospect fades, look for another —and another. Paige ran into an unexpected obstacle, for example, in marketing his trick box for transporting and storing large, delicate television tubes. He was asked to design a box in which the tube would be suspended, thoroughly protected from any rough handling the container might normally receive. The box he designed snaps into

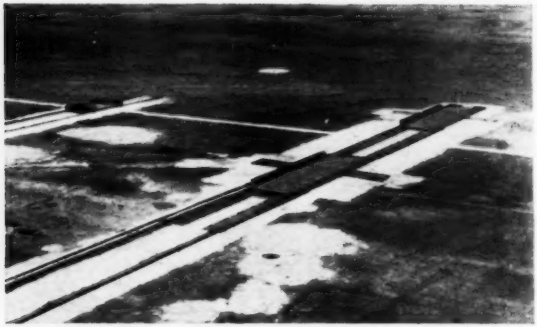
[Continued on page 260]

rectangular container (2). Downward pressure on rim causes upper part to slide into lower (3). At the same time, inner walls of lower part fold inward, slide into one another (4), and form tight double bottom (5). The cover of the box has flaps that fold down (6) and fit tightly between the inside and outside walls of the assembled box.



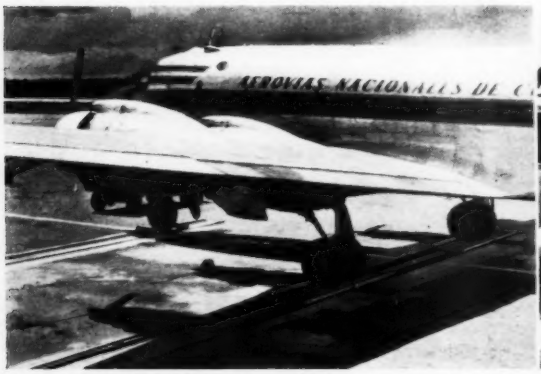


Passengers and Plane Ride Airport Railroad to Unloading Dock



1 THREE CARS ON RAILS, ready (above) to receive plane coming in from right, form a towing carriage to carry it between runway and terminal building. Car at far left holds nose wheel; cars in the center hold rear wheels.

PUSH buttons whisk a plane from airport runway to terminal and back again at Barranquilla, Colombia. An arriving plane taxis onto three rail cars. An electric winch and underground cables tow cars and plane—sideways—right up to a platform in the terminal building. After passengers get off and on, and cargo is unloaded and loaded, the cars return the departing plane to the runway. Called the Whiting Loadair, the system protects passengers from bad weather, speeds cargo handling and boosts airport capacity.



2 PLANE TAXIS ONTO CARS and locks its wheels in place on them. Then cars carry plane sideways to its dock in the terminal building. An airport can use as many car installations and docks as its traffic requires.

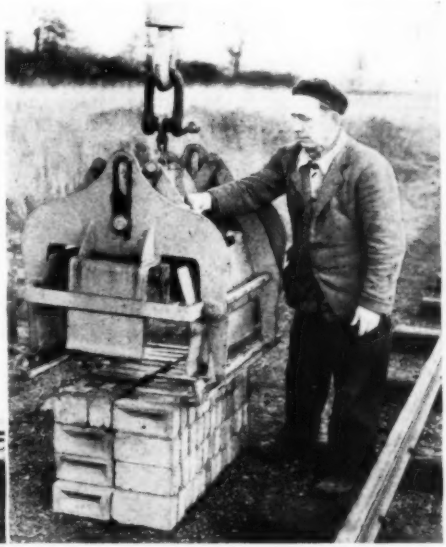
3 PASSENGERS ALIGHT on temporary platform (above) in test. Weatherproof platform will replace this open dock.

New French Microscope to Be Most Powerful in the World

FIRST of its kind, a proton microscope has been built in Paris. Improvements are expected to enable it to magnify 500,000 times, more than doubling the power of the best electron microscopes, and making it the mightiest in the world. It uses a beam of protons—the heavy, positively charged building blocks of matter—instead of electrons. They help it see more fine detail, as explained when plans were first announced by Claude Magnan of the College of France (PS, July '48, p. 122).

New Sabre Jet Hopped Up to Match the Russians' MiG

A NEW and faster Sabre jet, the only U. S. single-seat interceptor, is coming off the production line at North American Aviation to meet the challenge of the Russian MiG. The new model, called the F-86D, has cleaner lines and an afterburner for extra thrust. Shown here taking off, it can fight at 45,000 feet and fly faster than 650 m.p.h.



"Hatrack" Hoists Mortar

A "HATRACK" for mortar pails (left above) and a "brick grab" (right above) are two new devices intended to speed home construction in England, where nearly all buildings are made of masonry. Both gadgets are used with cranes. The rack can lift 10 pails of mortar at once and the grab can pick up 98 bricks. These devices and many others that are expected to help solve Britain's still-serious housing shortage are being tested at a center for construction research which was recently established at Barnet, near London.

U.S. Lifts Veil on 5 New Weapons

New Light Rifle Can Fire Like a Machine Gun

1 CONSTANT research is developing new and deadlier weapons to sharpen the striking power of all branches of our Armed Forces. One of the most promising is the new light rifle pictured on the opposite page.

In the quest for an even better weapon than the battle-proved .30-caliber M1 Garand, the Army set its sights high. The goal was a rifle of the same caliber that would do everything the M1 would do, weigh substantially less and deliver semi- or full-automatic fire as desired. This new rifle does the job. Weighing 1¾ pounds less than the almost 10-pound Garand, it fires a new half-inch-shorter cartridge (made possible by improved propellants) in 20-round clips and can actually get off 100 rounds a minute. It matches the M1 in accuracy, muzzle velocity, penetration and stopping power.

Since millions of M1s and billions of rounds of standard ammo are now on hand, the new weapon will not be generally adopted for some time, but it is expected eventually to replace the Garand as the GI's basic arm.

Meanwhile, a corner of the security veil has been lifted to permit a glimpse of other significant military developments, such as the new submarine below.

2 **Killer Sub.** The K1, surfaced for its first photograph at sea, is the Navy's newly commissioned antisubmarine submarine. Blunt and squat, it is 195 feet long and displaces 750 tons as compared to the present fleet type of 311 feet, displacing about 1,500 tons. It carries the latest types of sonar and other electronic detection equipment for hunting, and target-seeking torpedoes for killing. Its "ears" are said to be so sensitive that they can hear the breathing of crews in submarines nearby.

Cadet and Ordnance engineer examine new rifle that fires a 20-round burst in two seconds.

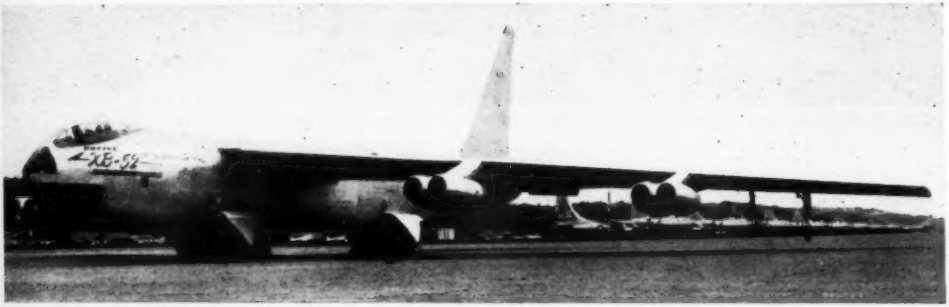
EJECTED SHELLS POUR FROM WEAPON as its performance and power are tested at Army's Aberdeen (Md.) Proving Ground.

SHORTER T65 CARTRIDGE, compared here with standard cartridge, works with smaller firing mechanism, made light rifle possible.

Please turn the page for pictures of three more new weapons.

3 New Gun Shoots Around Corners. Tank crews in Korea wanted a gun to blast off Reds who climbed onto their tanks. This cockeyed submachine gun is just what the GIs ordered. Actually a new barrel that can be fitted to a standard M3 "grease gun" in less than 60 seconds, it deflects regular .45-caliber slugs at 90 degrees in any direction. Its firing rate is 450 rounds a minute. The Germans developed a similar gun toward the end of World War II, but it did not perform well.

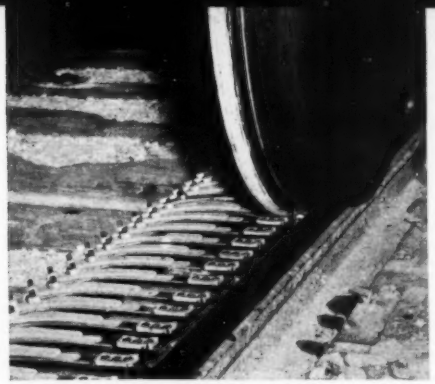
CURVED BARREL will be mighty handy for street fighting, as demonstrated above. At left, new deflector attachment is shown with M3 grease gun. Sights are secret.



4 Eight-Jet Heavy Bomber. This official photograph of the Air Force's huge new intercontinental bomber—the Boeing XB-52—"shows the least possible amount of information that could be of value to any enemy." Powered by eight Pratt & Whitney J-57 turbojet engines, the fast, long-range aircraft, nicknamed the Stratofortress, will probably replace the much slower B-36. The new plane's engines, now under test, are believed to be the most powerful in the world.

5 Giant Land Battleship. With details deliberately blacked out against the setting sun to safeguard military security, the nation's newest, biggest tank—the huge T43—looms on the skyline at the Chrysler Delaware tank plant where it was made. Army Ordnance officials say that it "will outslug any land-fighting machine ever built." Powered by an 810-horsepower air-cooled engine, the new heavyweight champ mounts a 120-mm. gun, largest ever used on an American tank.

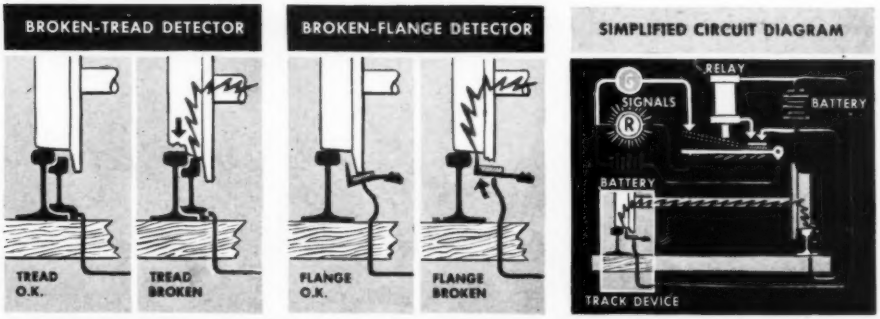
Detectors Spot Flaws in Wheels as Train Goes By



BROKEN-FLANGE DETECTOR checks wheels of passing cars on Ventura County Railway in California. Defective wheel lights danger signal, warning train crew.

STEEL fingers and rails that "feel" the wheels of a moving train now contribute to rail safety. By setting a trackside danger signal, they warn a train crew of wheel defects that might cause an accident.

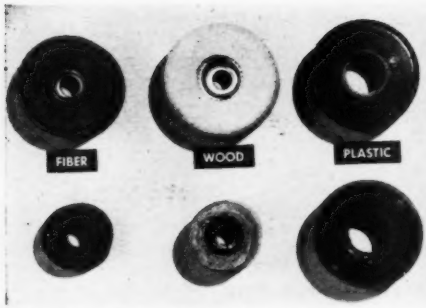
These Wheel Checkers are of two types, separately installed along the track. One detects broken wheel treads; the other, broken flanges. In the first, a broken tread allows a wheel to drop to an auxiliary rail, making an electric contact that lights a red signal. In the second, a broken flange permits the bare metal tip of one or more of a row of spring fingers to touch the car wheel, with the same result. An intact flange depresses all the fingers by riding over stainless-steel wear plates attached to each finger. These plates are insulated from the fingers with nylon so that no electrical contact occurs. The devices were invented by W. A. Gieskieng, a veteran Rio Grande railroad engineer, and his son, M. W. Gieskieng, an RCA sound engineer.



IF TREAD IS BROKEN, wheel drops from regular rail to auxiliary rail. If flange is broken, spring finger touches wheel. In either case electric contact short-circuits relay battery. Relay arm drops. This turns signal red, and puts a resistance (omitted in simplified diagram) in series with short-circuited battery to avoid drain on it. Relay is reset by hand.

Mechanic's Chore at 50 Below Tests His Fitness for Arctic

IT'S 50° below zero in the room at left. And the bundled-up airman has to open a bolted and wired chest, take apart a propeller-brush assembly he finds inside, reassemble and replace it, and fasten up the chest again. Trying the test in turn, youthful volunteers from Lackland Air Force Base, Tex., are revealing how well they could work in the Arctic, what gloves and other clothing are best, and how widely individuals vary in adaptability to the numbing cold.



Plastic Wheel Skates Longer

THE performer at right wears skates with plastic wheels that glide about the floor with a quiet hum. More important, they grip the floor and reduce danger of slipping during jumps, spins and turns. After three months' service, the plastic wheel wears down less than other types, as shown above, and has no flat spots. It was developed by U. S. Rubber and Fo-Mac Enterprises, Tulsa.

Sawed-Off Plane Delivers Paper

AN AIRPLANE that looks as though someone had sawed off half the fuselage handles many odd jobs abroad. A British Auster, it is pictured above delivering newspapers. It is also adept as a cable layer, an ambulance or a farm-chore plane.

Coal Carried by Pipeline

AN EXPERIMENTAL pipeline for transporting coal from mine to market is under test by Pittsburgh Consolidation Coal near Cadiz, Ohio. From 7,000 to 9,000 tons of coal a day, crushed and mixed with water to form a "slurry," go through the pipes.

Tire Needs No Air

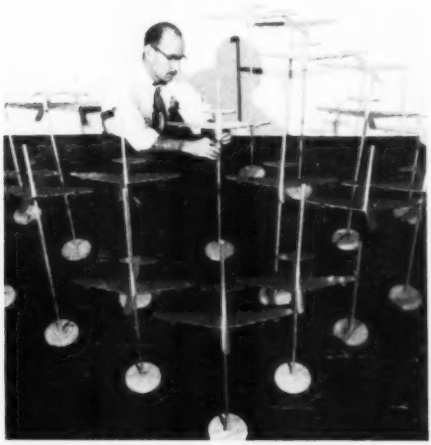
To OVERCOME tire blowouts, Antonio Pieroni of Italy has invented this inner-spring "tube" that lets you ride on springs instead of air. He claims his invention can be used in any ordinary tire and will support a car with no trouble. What happens if you are bouncing along and one of the springs breaks and damages the outer casing, he doesn't say.

Models Teach Formation Flying

MANY a military pilot must have told himself, "If only I could see how a flight of planes looks in miniature, formation flying would be easier to learn." He can see now: miniature B-36s on adjustable rods are in use at Carswell Air Force Base, Tex., to teach air crews. The little planes are moved up and down and tilted to simulate various altitudes and attitudes. W. E. Baker, Convair woodworker, built them.

Painter Pours It on Wire Fence

PAINT foreman R. W. Spence of Alcoa's New Kensington Works gets paint on the plant fence fast: he pours it. Suspended panels, in close contact with both sides of the fence, act as a trough coursing the paint over the wire. Excess paint drains into a catch pan and is reused. With a two-gallon oilcan, workmen below poured paint along the fence top, covered five-foot lengths in about five minutes.



Some of them didn't live very long, but they all made auto history.

Can You Name These Old Cars?

1 _____

HERE are 12 automobiles that were hits 35 years ago and more. The latest model was new when the United States entered the First World War. The earliest was a one-cylinder marvel when Teddy Roosevelt was starting his second term.

If you know them all, you're phenomenal. Eleven is an excellent score, 10 very good.

The answers are in the next column.

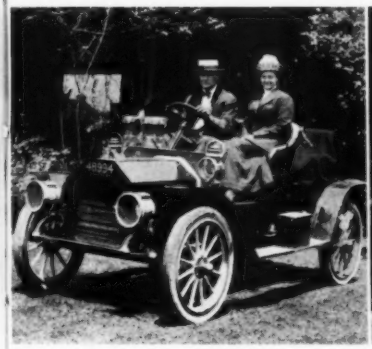
1, 1907 Studebaker-Garford; **2**, 1910 Hudson (first one built); **3**, 1908 White Steamer; **4**, 1907 Brush; **5**, 1917 Model T Ford. Yes, that's right. This was a special job made for diplomats by Japanese body builders; **6**, 1905 Reo; **7**, 1907 Buick; **8**, 1910 Hupmobile 20; **9**, 1908 Packard; **10**, 1912 Cadillac; **11**, 1909 Oldsmobile; **12**, 1915 Stutz Bearcat.

3 _____ 4 _____ 5 _____

9 _____ 10 _____

2

Photos from the Hi Sibley Collection



6 7 8

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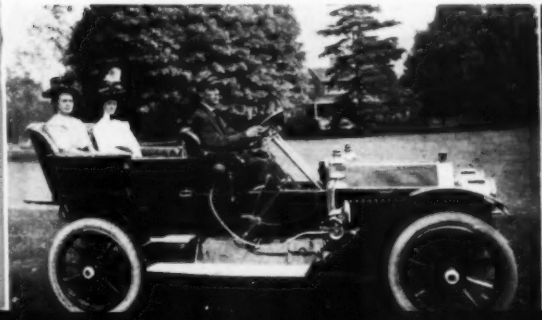


P.S.

Last minute news & notes...

TALKING HIGHWAYS may soon warn motorists of hazards. Road panels with wavy surfaces forming mechanical sound tracks of appropriate warnings have been patented by a San Francisco inventor. When a car passes over, vibration produces sound waves imitating the human voice, and the car body acts as a sound box to amplify them. The driver hears a spoken word such as "danger," "shoulder" or "crossing."

TRACHOMA, an eye disease leading to disability and blindness, appears to have yielded to the wonder drug Chloromycetin. Twenty-two out of 23 patients who took the preparation by mouth began improving within 24 hours, found the symptoms largely relieved in four days and have had no relapse three months after treatment.

FORECAST

"PICTURES OF THE PAST show log cabins, caravans and prairie schooners, crude utensils, hand weaving and the man with the hoe cultivating the fields. Today life is mechanized, electrified, abundant, easy because of the push-button era. In the future citizens will:

More effectively farm the land and the seas,
Clothe themselves from coal and oil,
Keep themselves warm by using a storage of the sun's energy,
Be cured of any ailments by a variety of drugs and medicinals,
Be happy, healthy and kittenish at 100 years of age,
And perhaps attend interplanetary football matches in the Rose Bowl."

--Dr. Roger Adams, retiring president, American Association for the Advancement of Science.

HOT DINNERS from slot machines in drugstores and cafeterias are on the way, says a GE engineer. You'll drop coins in, and a minute later you'll lift out a meat-and-vegetable meal you've chosen. Frozen food stored in the machine will be quick-heated by high-frequency waves from an electronic tube called a magnetron.

COMING IN 1954: A 60-passenger plane, the DC-7, that will cut transcontinental schedules by about an hour. Four Wright turbo-compound engines will give it a top speed exceeding 400 m.p.h., American Airlines and Douglas Aircraft announce. Turbines will harness exhaust gases to deliver extra power to propellers.

COCKROACHES, grateful to science, are now finding happy homes in TV sets. Basking in the tubes' warmth, they dine on glue in the cabinet. Dispossessing them calls for an expert and not a home spray job, the National Pest Control Association warns.

TV SETS are now being marketed with a guarantee of 150-mile reception, or your money back. According to The Hallicrafters Co., which sponsors this innovation, a new tuner and major circuit improvements give its 1952 sets the required sensitivity.

RIDING ON A BEAM OF LIGHT may be one way to get around in space, says T. F. Reinhardt of the Navy's Air Rocket Test Station. A space ship's speed will depend on the velocity of the jet from its rocket motor. So light, which is faster than anything, is worth thinking about; the motor might direct a beam of light, instead of a blast of hot gases, rearward. Its requirements are staggering: a 60-acre light source, 140 times the power-generating capacity of the U.S. and a weight (for a five-ton rocket) of only 5,000 pounds. But scientists are not overlooking even such remote possibilities.

The Editors

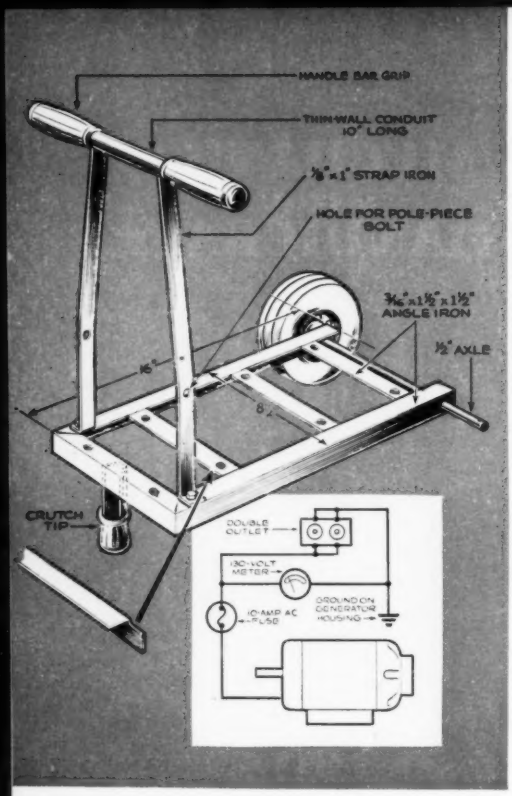
How I Assembled a Personal Power Plant

This craftsman's generator keeps AC on tap any time, any place.

By Howard G. McEntee

IF YOU have a summer camp away from power lines, a trailer, boat, farm or even a big back yard, you can use an electric generator that travels along with you.

I built one mainly to put power tools to work on a construction job at an out-of-the-way summer camp. I have a lot of other uses for it in mind, however. It will



CHECKING THE ENGINE. You need a gas engine that can deliver full power on long runs. This one was torn down for inspection, cleaning, some new parts and a thorough tune-up.

bring music and lights to picnics and beach parties. And if a storm ever cuts off electric service at my house I won't have to worry about my lights, furnace or freezer.

Gas engine. I had dreamed about packaging electricity for a long time but had been held up by the cost until someone offered me a run-down gas engine at a bargain price.

A little checking showed that the engine still had lots of life in it. New rings, a valve grind and a lot of cleaning gave me a reliable 1½-hp. power plant.

Generator. Once I had the engine running, my dream started to look like reality. I only needed to find a low-cost generator that could turn engine power into AC. To make sure the generator I bought would match my engine, I ticked off these main points:

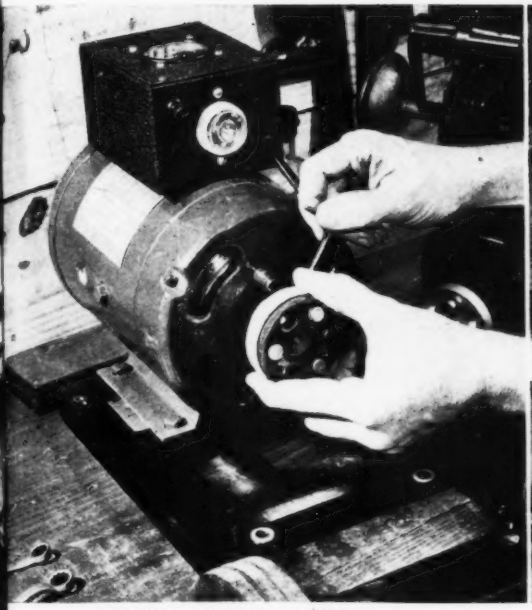
- *Power:* Self-excited generators—those that use part of the electricity they produce to excite their field coils—can put out about 400 watts per horsepower of engine capacity. A separately excited generator can increase the wattage about 20 percent but needs a storage battery to supply the priming current. For convenience, compactness and foolproof service, I decided on a self-excited one.

With an engine rated at 1½ hp., I could figure on a maximum AC output of about 600 watts. A generator of smaller capacity would waste the power of the engine; one of much larger capacity would waste itself.

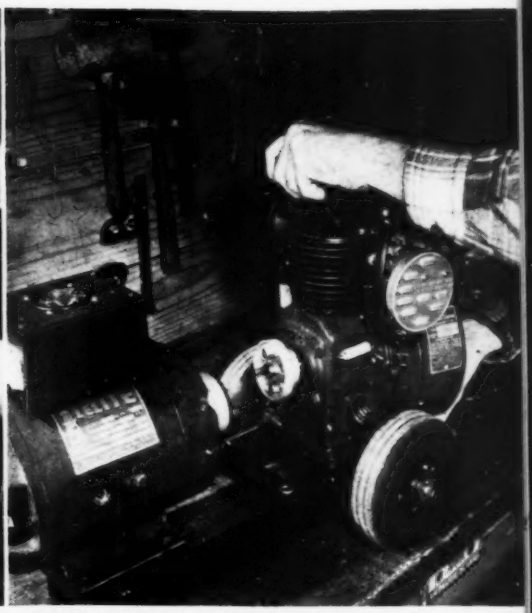
- *Speed:* Most modern gas engines reach their power peak near 3,600 r.p.m. To save fussing with belts or gears, I wanted a generator designed for this speed.
- *Frequency:* The few frequency-sensitive appliances I own—such as phonographs and electric clocks—are made for 60 cycles. To keep everything uniform, I listed 60-cycle output as a generator requirement.

With these needs in mind, I finally chose a standard Lejay generator, model SD 3675, a 750-watt job. I peeled off $65 for it and consoled myself with the thought that it was the only major expense of the campaign.

Assembling the frame. My next job was to get the two husky pieces of machinery combined in one unit. An angle-iron frame seemed best, so I cut and fitted strips of 3/16" by 1½" by 1½" stock and took them to a local welder. Anticipating that the engine and generator would tend to twist,



FLEXIBLE COUPLING would be a must even if generator and engine shafts could be aligned to the last hair's breadth, since the generator tends to twist when a load hits the line.



ENGINE IS SET IN PLACE after generator has been bolted to frame. All mounting holes are drilled a little oversize so both units can be shifted for best alignment.

I looked over the welder's shoulder to make sure he aligned and squared the pieces.

The generator would still try to twist even if it were bolted to bedrock, so it is essential that its shaft join the engine's through a flexible coupling. I got very economical here and used a 55-cent die-cast job that has worked fine.

I lined up the engine and generator as exactly as I could and bolted them to the frame. For extra rigidity, I bolted a ⅛″ by 1″ steel strap just over the engine crankcase, bent over the ends of the strap and bolted them to the sides of the generator.

It rides on wheels. My rig weighs almost 100 pounds. I can handle it in and out of a car trunk easily enough, but wheels are essential for getting it over ground. I bought a pair of 6″ by 2″ wheels with zero-pressure rubber tires and ran an axle for them through the engine end of the frame. The generator end is actually much heavier, but putting the wheels where I did helps steady the little truck when I yank on the rope starter. I added a rubber-tipped support under the generator to provide three-point suspension—which won't teeter on uneven ground.

On top of the generator I fastened a 3″ by 4″ by 5″ steel box of the kind sold in radio-supply stores. I installed a socket in back (for a 10-ampere fuse), a double porcelain socket in front (for power take-off) and a 130-volt AC meter on top. I wired them as shown in the sketch.

The meter is a little luxury I added for my own information. It isn't essential because the engine has a governor and the generator has pretty good voltage regulation. Unloaded, the generator puts out about 130 volts. With 600 watts on the line, output steadies off at 115 volts. Higher loads slow the engine down a bit, and when I hook on 750 watts of appliances the voltage dips to 105. I usually set the gas-engine governor to produce 115 volts at no load; I know then that there's no chance of feeding excessive voltage to any appliance.

The jobs it does. Small appliances are a cinch for my AC substation. I can load on as much as 600 watts of lamps, heaters, soldering irons, radios, clocks, phonographs and small electric tools and she takes it without a whimper.

Large motors could be a problem, I knew, because they need so much current for

EMERGENCY POWER for a house can be fed in at any outlet, preferably outdoors or in the garage, where engine's exhaust is no problem. Make a special connection cord with male plugs at both ends. You'd better hide this cord so no one can use it by mistake.

PORTABLE ELECTRICITY can travel and work anywhere. The substation weighs about 100 pounds—light enough for one man to handle.

starting. To find out what's what, I lined up a few motors for testing.

Motors Aren't All Alike

I have often read that you must not run split-phase motors on small power plants. I had to try it, of course, but I was quickly convinced. A ¼-hp. motor of this type hesitated a long time and then just managed to start. It was unloaded, and I was bright enough to leave it that way. Split-phase motors may need six times their running current to start (that's why the lights dip so noticeably when you turn one on). My little power plant just doesn't have the 2,500-odd watts it takes to get some loaded ¼-hp. split-phase motors spinning.

A ⅓-hp. *capacitor motor* started quickly when not loaded but dragged a bit when hooked to a small, hard-starting air compressor. The ¼-hp. capacitor motor on my furnace blower came up to speed slowly but surely and then ran fine. The same kind of motor in an eight-cubic-foot refrigerator didn't know the difference between my generator and the power company's.

Capacitor motors take about three times running current for starting. This generator will drive as much as ⅓ hp. if the load isn't too heavy.

If I want to run greater loads or bigger motors (up to ½ hp.), I use either a brush-type *universal motor*—the kind found in vacuum cleaners and most portable electric tools—or a *repulsion-induction* job, which needs only about twice the running current for starting.

Stagger Big Loads

Knowing all this, I won't try to start a batch of motors simultaneously even in an emergency. But by staggering loads I can have my house warm, my refrigerator cold, and all the lights I need for the duration of any power interruption.

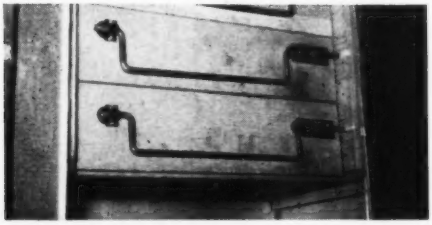
To feed emergency power to a house, just plug the generator into an outlet. If you have a three-wire feed system, temporarily bridge the two "hot" wires. Open the main switch at the fuse box just in case utility power comes on.

My summer-camp construction job? Electricity cut the boards, drilled the holes, sprayed the paint, kept the coffee warm, lighted the night work and did a lot of other chores that more than repaid the 80 dollars or so it cost me to become a private utility. END

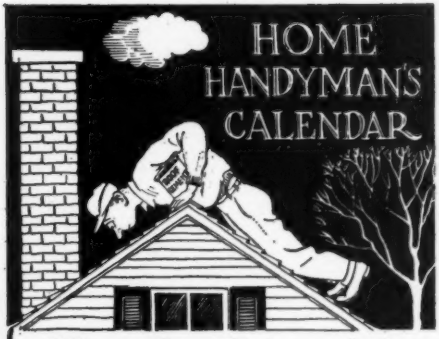
Rack Stores Wood Under Steps

A LUMBER rack under the basement stairway puts usually wasted space to good use. The frame shown is made of two-by-threes. The crosspieces are one-by-twos spaced a foot apart to permit free air circulation around the lumber. Long pieces are stored at the bottom of the rack and others at levels according to their length.—*Walter Haase, Hartford, Conn.*

Bolt-Pull Locks Truck Drawers



PULLS like these are handy for drawers in service trucks. When closed, the drawers are locked and can't be shaken open by the truck's motion. To make a pull, remove the locking pin from a barrel bolt, bend a rod of the same diameter as the bolt and substitute it for the bolt. Fit a locking pin in the rod and drill a hole in the cabinet's side to take the end of the rod. When the handle is raised it can be moved to the left to unlock the drawer.—*Carl Tretin, Austin, Minn.*



March This is a month of snow and slush, changeful weather that heralds the coming of spring.

- After a thaw, see what winter has done to your roof. Look for breaks in and around chimneys, flashings and vent pipes. Calk with plastic roof compound, but not when surface is damp or temperature is below 55°.
- Dust off your window screens and see if they are ready for the insects. Patch or replace torn screening. If the frames need painting, do it now so they'll be ready to install quickly when the weather signals screening day is here.

- This is probably the best time of year to damp-proof your basement walls. March is usually wet enough to bring out moisture you'd miss at other times.
- Clean outdoor drains, culverts and gutters. Gather the winter's crop of fallen branches and cut the big ones to fireplace length. Insects will be breeding soon, so make tight all permanently installed screening, such as that in attic and basement vents. If you closed these vents for the winter, open them now to prevent dry rot. Drain and refill hot-water tank.

Home-Welded Cart Made of Conduit Carries Golf Clubs

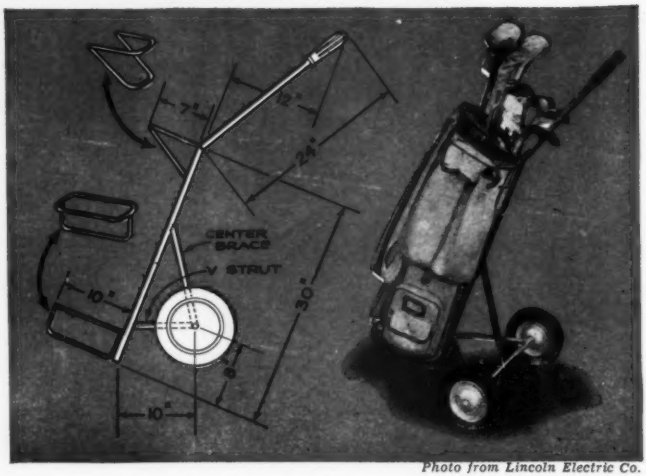


Photo from Lincoln Electric Co.

CHASING the little white pill over the green can be more relaxing with this caddy cart along to tote your clubs around the course for you.

Thin-wall electric conduit, ½" in diameter, comprises the backbone and axle struts. This tubing can be welded with a small 115-volt transformer-type welder, 5/64" electrodes and the high-ampere tap being used. Welded construction simplifies joint fitting, and there are no bolts or nuts in the assembly to come loose.

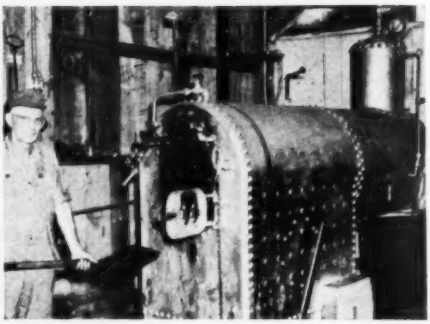
Start by cutting and welding a 54" length at the angle shown to form the backbone and handle. Cut a 20" piece of cold-rolled steel rod for the axle and weld to it the horizontal V strut.

Lay the backbone on the floor, with the handle pointing up. Block up the axle to get it square, and weld the strut to the backbone. Then add the center brace.

Shape the bag cradle from 5/16" rod to fit your golf bag, and weld it on square to the main member. The top bag holder is formed of two U-shaped sections welded together at the tips.

Thread the axle ends and attach 10" semi-pneumatic ball-bearing wheels with acorn nuts. You can get such wheels from a discarded coaster wagon, or buy them from a bicycle shop or mail-order house. Paint body and wheel contrasting colors and slip a bike handle-bar grip on the handle.—*J. B. Quigley, Chicago.*

Old Tractor Serves as Furnace



PURCHASED as junk, an old steam tractor was converted to a stationary boiler for heating a large garage. The boiler was stripped of running gear and mounted on a concrete base. Despite its age, the rig supplies ample heat even on low steam pressure and operates economically.—*Grover Brinkman, Okawville, Ill.*

Asbestos Paper in Small Rolls

HOUSEHOLD-SIZE rolls of asbestos paper 18" wide and 12' long can now be purchased in hardware stores. Among home uses suggested by the maker, Sall Mountain Co., Hamilton, Ohio, are: covers for furnace pipes, shields to protect walls from heat or sparks, stove mats, hot plates, and fireproof ironing-board pads.

Battery Clamp Holds Red Flag

IF YOU sometimes haul lumber, pipe or other material that sticks out from the car, keep a red cloth and a battery clamp in the glove compartment. With the clamp, you can quickly clip the flag to a load.

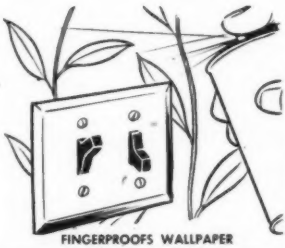
Spray It with Plastic

You'll find a thousand-and-one uses in your shop and home for a can or two of the new acrylic sprays.

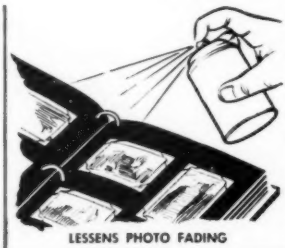
A PRESSURIZED can of liquid acrylic puts a magic brush in your hands. Shot from a nozzle as a fine spray, the plastic speedily dries into a tough, smooth, waterproof film. Polished metal stays bright. Rust won't form. Finger marks wipe off. Spilled liquids, even alcoholic ones, do no harm.

Though on the market only a short time, the pressurized plastic has already found many odd jobs. Police departments use it to preserve smeary fingerprints. Wigmakers spray mannequin hairdos. Hunters, tormented with chigger bites, use the spray to keep calamine lotion from wiping off. The Massachusetts Archaeological Society reports it's fine for "stiffening" fragile specimens before unearthing them. Nuns in India use it to keep the delicate ruffles on their habits from wilting.

You've probably used the spray on auto chrome, tools and polished ornamental brass and silver. Some less familiar household uses are shown below. The spray you'll want most is clear, but it comes in colors, too.

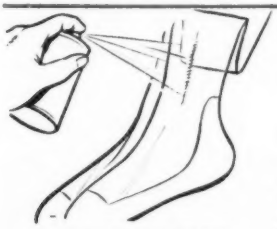


FINGERPROOFS WALLPAPER

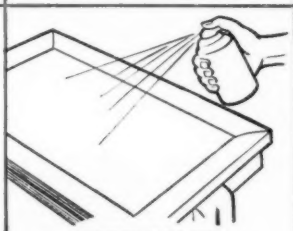


LESSENS PHOTO FADING

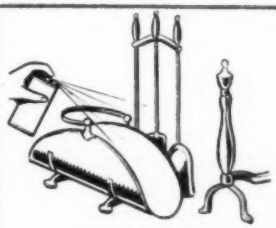
GREASEPROOFS WALLS



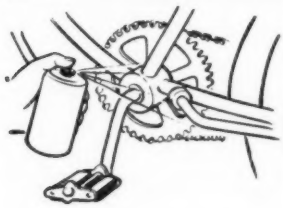
STOPS RUNS IN NYLONS



PROTECTS TABLE TOPS



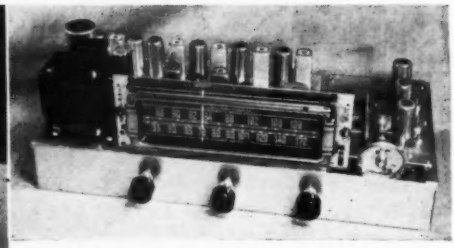
KEEPS BRASS POLISHED



RUSTPROOFS MACHINERY

SEALS WALLET CARDS

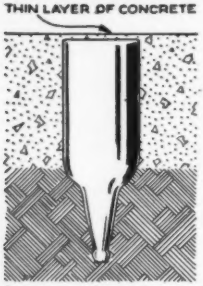
PROTECTS LEATHER



FM Kits Come Partly Wired

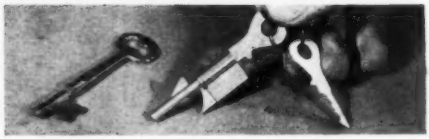
You don't need test equipment to "line up" this FM radio kit after you build it. All critical parts are wired and aligned at the factory. The subassemblies and non-critical parts fit into cut outs in the chassis and can be easily connected together. Collins Audio Products Co., Westfield, N. J., offers the Pre-Fabs with a variety of interchangeable subassemblies. That way the builder has a choice of price and quality and can also start with a simple set or tuner and add extra features later.

Bottle Saves Place for Post



When you pour concrete for a drive, it's easy to provide concealed post holes for a fence that you may someday want. Embed bottles in the wet concrete, selecting ones about ½" bigger in diameter than the posts will be. Cover them over with a thin layer and make a locating mark. If you ever need the holes, break through with a crowbar.—*Warren Howe, Longview, Wash.*

Keyhole Lock Locks Door Lock



The security of old-fashioned door locks is doubled by this keyhole lock. After the door has been locked and the key removed, the keyhole lock is inserted in the keyhole. It blocks the entrance of the regular key or of lock-picking tools. The keyhole lock can be removed from outside by inserting its key. Then the regular key can be used. Keil Lock Co., Charlestown, N. H.

Concrete Wall Cast by Machine

You can cast a concrete wall in continuous strips with the machine at right. All you do is fill the 27"-long metal form with concrete, tamp the concrete, then pull the machine along to build the next wall section. In warm weather it takes only a few hours for a strip to harden before another layer can be put on top of it.

One model of the machine lays a strip 8" by 8". Another builds sections 4" thick and 8" high for walls that are to be veneered with rock or brick. The third model lays a wall 5" thick for a flagstone finish. Carl N. Dudley, Doniphan, Mo., makes it.

New Colored Sealer Finishes Wood

A SYNTHETIC-RESIN sealer that protects wood, colors it and shows up the natural grain all at once is the latest wood finish for home use. Called Rez, it can be used indoors or out on wood, plywood, siding, shingles, fences, trim and furniture. It is available in five shades: redwood, driftwood, sage, cedar and mahogany.

Beginning with raw wood, the exterior of a house calls for two coats and the job is done. On outdoor furniture, brush on two coats, wait 24 hours for drying and finish with one coat of spar varnish.

The photos show how one coat of the new Monsanto sealer does a complete job of finishing interior woodwork.

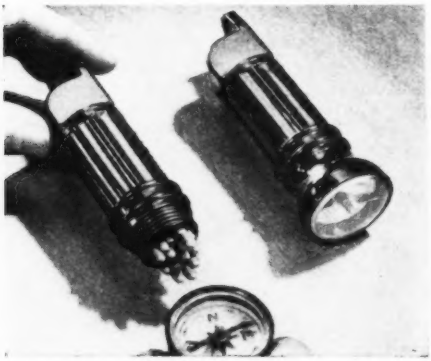
SAND THE WOOD for best results, ending with 5/0 or 6/0 paper. On an open-grained wood such as oak, you may want to use a wood filler first.

BRUSH ON color-toned sealer generously. Spread by brushing with grain, just as you would if you were painting. One coat is enough.

WIPE SURFACE with a clean rag if you want lighter tone. Rubbing will also equalize uneven spots caused by irregularities in the wood.

Compass Stores Matches

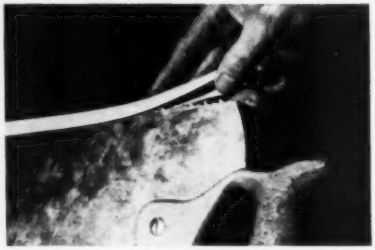
THREE essentials for the sportsman are housed in this Tenite plastic case. A waterproof, luminous compass caps one end. On the other end is a long-range whistle. The center holds matches or small maps. Kumbak Co., Minneapolis, makes it.



Flower Box Hung on Porch Rail

A FLOWER box can be hung on an iron porch railing by using two angle brackets. Bolt or wire the brackets to two of the iron pickets and rest the box on the brackets. For security, wire the box to a picket.—*Andrew Vena, Philadelphia.*

DO IT THE EASY WAY



TO PROTECT THE TEETH of saws carried in a toolbox, encase them in split rubber tubing. On circular saws, join the tubing with a paper clamp.

TO RESTORE A LIMP TAPE MEASURE, place it between sheets of wax paper, then press with a hot iron. Enough wax is transferred to the tape to stiffen it.

TO CLEAN WINDOWS smudged with putty oil or filmed with grease from cooking, try mixing kerosene into the wash water. Use approximately one tablespoon of kerosene to a pan of water.

WHEN A GLASS SHATTERS, moistened cotton will protect your fingers while doing a thorough job of picking up the pieces. Even the tiniest slivers are caught in the meshes of the cotton.

Thumb Nut Tightens V Belt

THIS belt tightener maintains a fixed distance between the driving and driven pulleys, unlike spring- or weight-loaded tensioning devices. Moreover, it will not accentuate vibration, as the others may. Drill and tap the motor base for a 12-24 thread. A lock nut holds the rod to the motor base. Mount the steel angle with a minimum of 1" clearance from the motor base. Before changing belts or pulleys, loosen the motor-mounting bolts, then the thumb nut.—*A. L. Sprecker, Freeport, N. Y.*

Dolly Helps You Lay Floor Tile

A SMALL wooden platform with a caster at each corner is a handy homemade accessory when you are laying floor tile. You can roll your supply of tiles along with you as you work. The platform is also handy for moving a bucket when mopping floors. —*R. F. Donavan, Guttenberg, N. J.*

Stake Truck Works as Dumper

THE Less Farms of Columbiana County, Ohio, save unloading time and labor by making stake-body trucks into dumpers with hydraulic lifts. Below, lima-bean plants are being dumped.—*J. Krill, North Lima, Ohio.*

Here's the Inside Story on

New Car Chromes

By R. P. Stevenson

Handle new-car trim with care —the nickel that toughened it before has taken a defense job.

ALL that glitters on a new car these days is not chrome. Some of the bright metal may be stainless steel, and some, inside the car, shiny zinc plate. Even the chrome that remains is mostly a new type, coated with clear enamel and requiring different care to keep it shiny.

The switch from conventional chrome plate—chromium over nickel, or chromium over both nickel and copper—began a year ago when the government restricted the use of nickel and ordered it stockpiled for defense purposes.

Since then, all motor manufacturers have been trying to find acceptable bright substitutes for regular chrome. They have not yet turned up exactly what they want, but a couple of prospects indicate that out of the continuing search may eventually come new forms of decorative trim as troublefree as old-style chrome plate.

Nickel Stops Rust

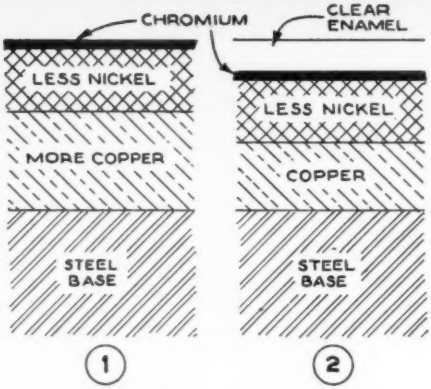
Regular chrome has always relied on nickel to combat corrosion of the steel base. An initial copper coating, varying in thickness from a mere flash up to .001″, frequently precedes the nickel, which may range from .0005 to .002″. The function of the copper is largely to provide a smooth base for the nickel. Copper on steel parts offers some rust protection, but does not equal nickel.

Nickel is bright. But exposed nickel soon tarnishes—as you may recall if you ever had the chore of polishing the plain nickel plate commonly used on cars before chrome came along in the Twenties. A very thin coating of chromium, from .00001″ to .00002″ thick,

STANDARD CHROME PLATE for cars usually followed these specifications before nickel became short. Copper, however, was not always plated under the nickel. When used, its main purpose was to provide a smooth base for the nickel. Nickel gives the plate corrosion resistance, chromium tarnish resistance.

Here are types of bright trim you might find on a new car.

To save nickel, car makers could use any of these types of trim. Nos. 1 and 2 are most likely to be found on bumpers, for the government still allows some nickel on such functional parts. Purely ornamental trim, both inside and outside, usually is No. 3, although some car makers are using No. 4—stainless steel brightened with chromium—for such parts as window moldings. The clear chromate dip in No. 5 both brightens the zinc and gives corrosion resistance. So far, this has found only limited use for some inside trim. If copper becomes scarcer, manufacturers might turn to No. 6. The clear enamel on four types gives protection against rust. It is about .0005″ thick.



applied over the nickel provides tarnish resistance.

While chromium is being electrodeposited, strains develop. To relieve them, the chromium cracks—like mud drying in the sun. These cracks are so fine that you need a microscope to see them. But moisture and corrosive agents in the atmosphere easily find their way into the cracks. If chromium is plated directly on steel, rust quickly forms at the bottom of the cracks, expands them and undermines the plating. With nickel underneath, corrosive agents form a little tarnish in the cracks. But this causes no trouble.

The National Production Authority order on nickel, issued early in 1951, permitted the use of this metal in functional automobile parts such as bumper bars, bumper guards and door handles, but limited the thickness to a maximum of .001″. All nickel plating was forbidden on strictly ornamental parts.

To spread out their nickel allotments and inventories, car manufacturers generally beefed up the copper coating and deposited less nickel on all functional parts, frequently less than the .001″ allowed. The results are not always satisfactory.

Enamel Protects Ornamental Trim

On ornamental brightwork, and at times on functional parts, too, the thin coating of chromium is now applied directly on a primary plating of copper. On top of this is a protective coating of clear enamel.

These synthetic enamels, developed within the past decade, have been a godsend to car makers during the nickel shortage. One of their major characteristics is a glasslike surface. On the chrome, they are practically invisible. Some are baked on—like car-body finishes. When baked on a plating of chromium, a clear enamel covers and fills the microscopic cracks, fighting corrosion from the outside just as nickel used to do from the inside.

Without this protection, chromium over copper would let corrosive agents work on the copper. The brown or green corrosion products would seep out of the chromium cracks and cause stains and discoloration. Corrosion under the chromium also might cause it to peel or chip off.

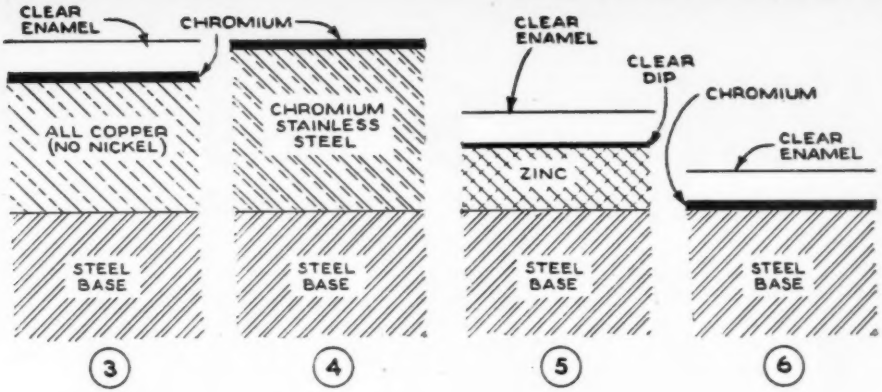
Never Use Abrasive Polishes

This is why special instructions to new-car buyers urge so strongly that the protective coating be kept intact, that any scratches be repaired promptly and that abrasive polishes be avoided. Since there is no easy way of telling just what kind of brightwork you have, short of hacksawing through each piece, it is wisest to follow these instructions on *all* shiny parts.

Until the close of 1951, the auto industry received practically enough copper for its plating needs. But NPA copper allotments for this year have been cut sharply. With copper as well as nickel running short, car makers will have to scramble still harder to shine up their products. As a hedge against an impossible situation, some of them are reducing the amount of brightwork on 1952 models.

What Are the Other Choices?

To keep up the trim supply, manufacturers have several other choices. They can plate chromium, still in good supply, directly on steel, brass or zinc parts and protect it with clear enamel. They can use zinc plate, specially brightened and protected by the same enamel. Or they can



extend the use of all-chromium stainless steel.

Plating chromium directly on a base metal puts the full burden of corrosion resistance on the enamel coating. Whether it will do the job has not yet been proved, but there is some indication that the coating stays in the chromium cracks, even if it is removed from the surface.

Ordinary stainless steel requires nickel and chromium. It is taboo for use on cars. But by substituting chromium for all of the nickel, fabricators produce a stainless almost as durable. Many car manufacturers have been using this all-chromium stainless steel. Given a flash of chromium plate, it matches the rest of the brightwork and stands up well in use.

Supplies of all-chromium stainless are limited, however, and would not be likely to stretch far if all car makers decided to use it more extensively.

The other possibility is coated zinc plate. This looks much like chrome. A chromate dip gives it a pleasing luster. In production cars, its use so far has been limited to parts inside the passenger compartment. But in one continuing test, zinc-plated hub caps on half a dozen cars have shown no signs of failing after nearly a year's service.

Zinc plate stepped into an emergency once before—and made a permanent place for itself. This was in 1943, when tin-dipped refrigerator shelves became a war casualty. Since then, coated zinc-plate shelves have proved they could stand up as well as tin in the corrosion-producing atmosphere inside a refrigerator. END

AUTO TRIM CARE

ON 1951 AND 1952 CARS: Wash the trim every week or so with clean cold water, using mild soap or detergent if desired. Apply with a soft cloth or sponge, never a bristle brush. Rinse with fresh water, dry with a clean cloth.

If a trim part remains dull after washing, try polish in an inconspicuous spot. This part may be regular chrome plate or stainless steel, not protected by clear enamel.

Use naphtha or white gasoline on a soft cloth to remove road oil or tar. Wipe gently to dissolve the stain without scratching the finish.

If a scratch appears in a clear enamel coating, it must be repaired immediately to prevent rust or discoloration. As a temporary measure, fill scratch with auto-body wax. For a permanent repair, feather in the scratch very lightly with OOO steel wool and fill with refinishing material recommended by your car dealer.

Do not use chrome cleaning or polishing compounds on new-type chrome. If it is absolutely necessary to use one of these to remove rust, use it sparingly and lightly. Immediately apply a recommended refinishing material.

ON 1950 AND OLDER CARS: Wash the chrome regularly. This is especially important if you live near the seashore or industrial area. A salt atmosphere or certain types of factory smoke promote rust.

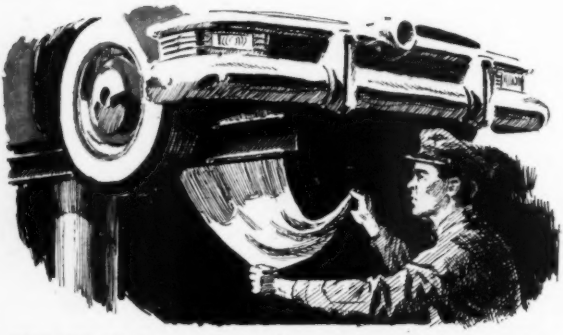
Bring back the luster with any common polish—a special chrome polish, a household cleaner, painters' rubbing compound or the like.

Wax the chrome, using the same wax you use on the car body. A light oil is sometimes used, but this collects dirt unless all excess is carefully removed. You can also wipe, brush or spray on one of the new protective liquids now being sold for the purpose.

FOR YOUR POPULAR SCIENCE INFORMATION FILE

HOW You Can Save Oil

Check these seven waste points before overhauling an engine.



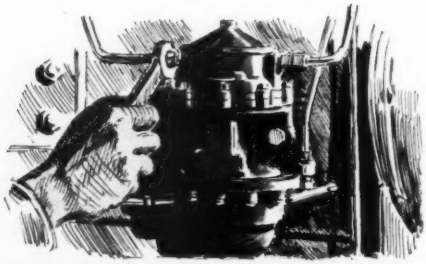
KEEP PRESSURE CORRECT. High oil pressure can flood an engine with oil. Some will then go out the tailpipe.

STOP THE LEAKS. A drop on the road every 20 feet mounts up to a quart every 100 miles. External leaks can be located by driving with cloth tied under the engine. New gaskets or tightening a nut or two will usually stop this waste.

DON'T OVERFILL CRANKCASE. So much oil will be thrown on the cylinder walls that the piston rings will not be able to wipe it all down. Some will be burned.

WATCH YOUR SPEED. Heat removal is a big part of the job that oil should do. Driving fast heats up the engine, puts a heavier burden on the oil and thins it out. Oil then can easily sneak out past worn bearings and poor rings.

CHANGE OIL FREQUENTLY. And watch the filter. If carbonization and dirt clog oil passages in rings and pistons, excess oil can't return to crankcase—and some will burn. Good oil kept clean by regular changes will help keep piston rings from sticking in their grooves. Stuck rings can't expand properly and so let oil into combustion chamber.

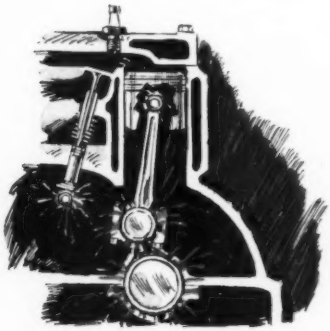


CHECK THE DIAPHRAGM in the vacuum booster pump. If it is defective, oil vapor can be sucked through it into the intake manifold and on to the combustion chambers. Even some new diaphragms are porous.

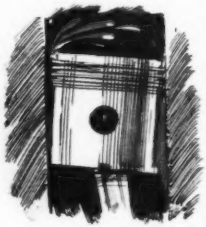
CLEAN VENT AND BREATHER PIPES. If they are clogged, high crankcase pressure may cause oil leaks at front and rear main bearings.

WHY Engines Burn Oil

If the dipstick still reads low, look for these basic reasons.



WORN OR CRACKED MAIN BEARINGS discharge more oil than is needed for good lubrication and cooling. Flowing along the rotating crankshaft, the excess oil is thrown up into the cylinders. Some gets past the rings and burns in the combustion chamber. Out-of-round journals and worn or cracked con-rod and camshaft bearings waste oil in the same way. Unequal tightening of main-bearing or con-rod bolts causes fast bearing wear.

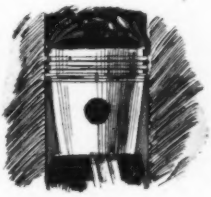


TAPERED CYLINDERS let pistons rock. When piston tilts one way, a large amount of oil goes up between it and cylinder wall. When it tilts other way, oil passes on into combustion chamber. Rocking action also rounds off edges of rings so that they can't control oil.

WORN OR BROKEN PISTON RINGS allow oil to be drawn into the combustion chamber on suction stroke. In an overhaul, new rings are always desirable. Their big job is to seal off combustion zone from crankcase region.

WORN RING GROOVES and broken lands are real troublemakers. As the pistons move, the rings should seat on the sides of the grooves to prevent leakage. Wear that is detected before it has gone below the top groove can be corrected by truing up this groove and installing an overwidth ring or a spacer and standard ring. Groove wear eventually may lead to broken rings or lands. Besides letting oil by, a broken land may damage the cylinder wall. A new piston is the only repair.

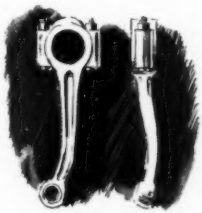
LATE VALVE TIMING keeps intake valve closed too long after suction stroke has begun, increasing vacuum in cylinder. This high vacuum tends to suck oil up past piston.



COLLAPSED SKIRTS cannot scrape excess oil from bottom of cylinders as they should. They also allow pistons to rock in the cylinders. In an overhaul, reshape collapsed skirts or replace the piston.

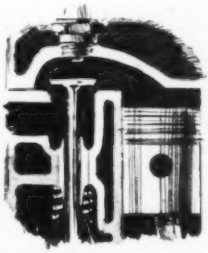
CYLINDERS DISTORTED by unequal heat distribution or unequal tightening of head bolts present a surface that piston rings may not be able to follow closely. Therefore, rings won't sweep oil down and it burns.

A HARD GLAZE that sometimes forms on cylinder walls should always be removed when new rings are installed. Otherwise, the rings will not seat properly and oil will be burned.



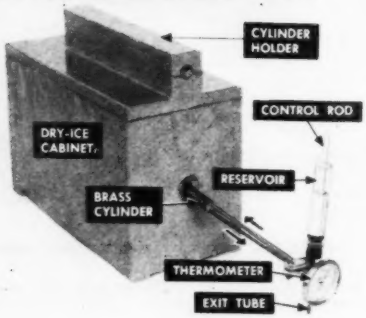
CON RODS that are bent or misaligned keep pistons from riding straight in cylinders. Hence, pistons and rings can't form a good oil seal. A bearing in a bent rod will wear rapidly and throw oil into cylinder.

WRIST PINS can cause a heavy discharge of oil onto cylinders if worn, badly fitted, or the wrong type. Pins fitted too tightly at the ends distort pistons by keeping them from expanding and contracting.



INTAKE VALVES with worn stems or guides let engine vacuum draw oil vapor into the combustion chamber. This excess clearance should be corrected when new rings are installed, or the increased vacuum will make the engine use more oil than it did before. If deposits are removed from valve stems during an overhaul, and they usually are, you lose the seal they formed—and oil loss becomes greater.

Adapted from *32 Reasons for Oil Pumping*, by Koppers Co.



Antifreeze Tested by Freezing

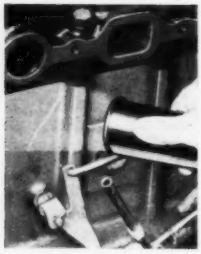
REGARDLESS of what antifreeze you use, a new testing device developed by the Bureau of Standards shows exactly the lowest temperature it will withstand. The most inexperienced gas-station attendant can make the test in five minutes.

In contrast with the familiar hydrometer, which simply measures specific gravity, the new tester actually freezes a sample of your radiator solution.

Its heart is a brass cylinder containing a passage the same size as a typical radiator passage. This cylinder is inserted into a cabinet filled with dry ice. Lifting a control rod lets a sample of antifreeze flow from a glass reservoir.

When freezing stops the flow, the cylinder is pulled from the ice, inserted in the holder atop the cabinet and allowed to thaw. When the second drop comes from the exit tube, the thermometer is read. This is the lowest temperature at which the mixture will flow in your radiator.—*Arthur P. Miller, Jr., Alexandria, Va.*

Ultraviolet Spots Radiator Leak

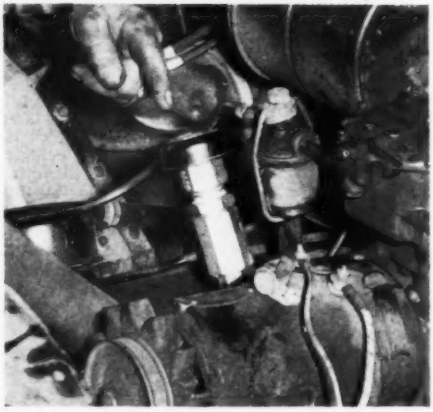


A FLUORESCENT powder added to a car cooling system shows up water leaks when a special ultraviolet test lamp is played over the engine in the dark. Any seepage glows intensely when the beam hits it. Allen Electric and Equipment Co., Kalamazoo, sells the ultraviolet lamp and fluorescent powder.

Soap Stops Windshield Fog

GLYCERIN soap will help keep your car windows from steaming up on cool or moist days. Buy a cake at a drugstore and cut a smooth face on one side. Then rub the inside of the windshield and other window glass. Wipe away the excess with a clean, dry cloth. One treatment will last for several days. — *Lee Jackson, Ann Arbor, Michigan.*

Air Valve Cuts Exhaust Pops



HIGH vacuum built up as you coast against compression may cause gasoline and oil to collect in the firing chambers of your car engine. Then, when you hit the accelerator at the foot of the hill, smoke puffs from the tailpipe.

An air valve designed to be installed in the intake manifold prevents this by relieving excess vacuum pull. The maker, Auto-Vac Manufacturing Co., Minneapolis, claims this eliminates carbon and cuts oil consumption.

MAKE UP YOUR BED, using a pillow and blanket stored in the trunk. The bed has a hump or two, but it's far better than the seat for some shuteye.

3 Steps Convert Car to Bed

If sleepiness overtakes you on the road, this rig allows you to take a restful nap.

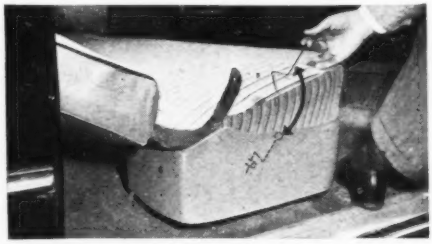
FORTY winks can be a lifesaver when you get sleepy on the highway. It's smarter to pull off the road and rest than to keep driving with flatirons hung on your eyelids.

Edward T. Connors of White Plains, N.Y., found he could convert his two-door Ford sedan into a comfortable bed. Nothing in the car is altered, and all he carries, in addition to blankets and pillows, is a couple of small wooden supports.

These are a simple hammer-and-nail job, as shown below. They are placed in front of the rear seat. Then the two front-seat backs are removed and laid between the front and back cushions, the rear ends on the wooden supports and the front ends on the steel frame of the front cushion.

Placed this way, the seat backs can't slip. The sleeping surface is amply long even for a tall man, although his feet may overhang the front cushion. If one passenger wants to sleep while the other drives, just one side can be made up.

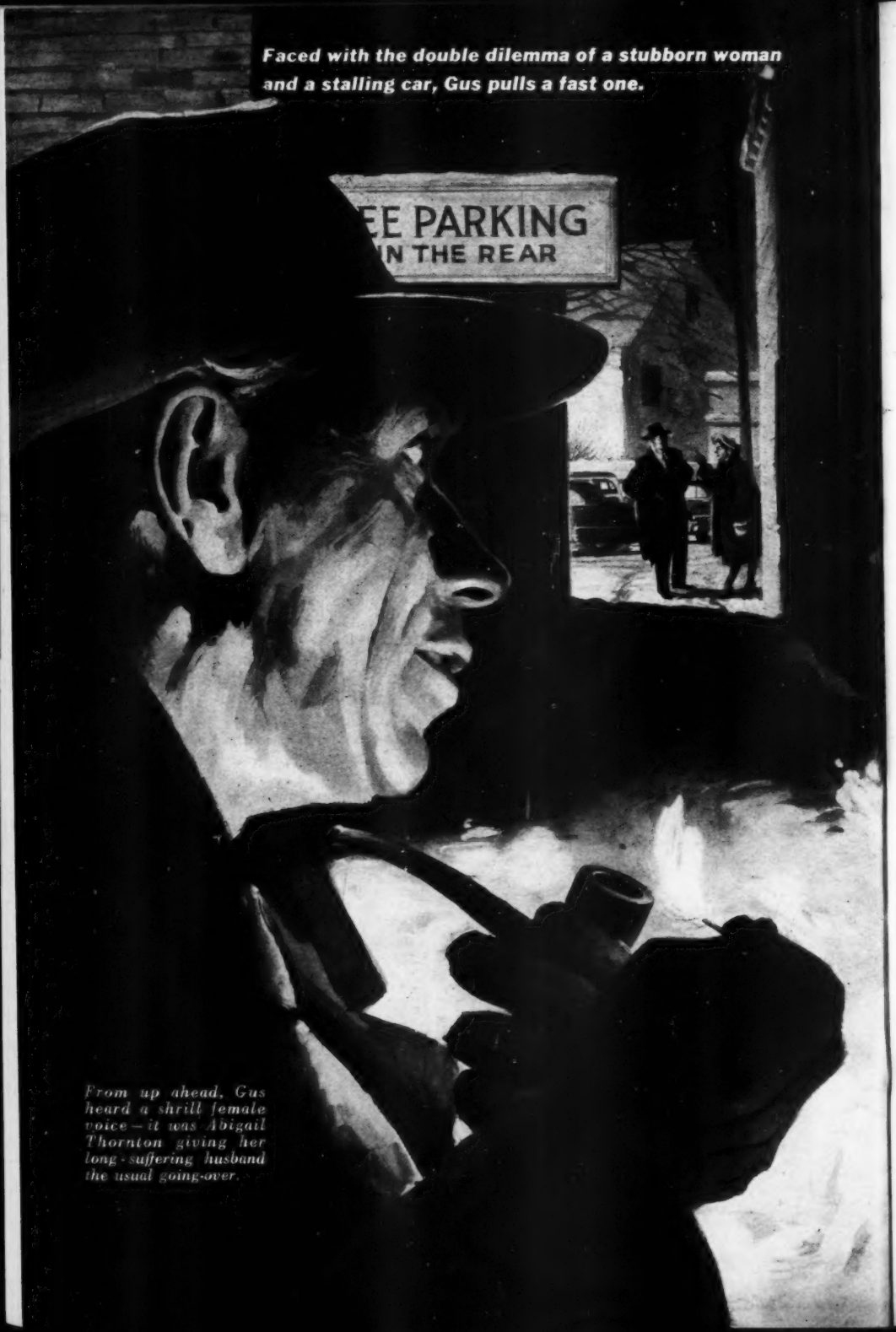
Connors has converted both a 1950 and a 1951 Ford. The cost, if scrap lumber is used for the supports, is zero. END



1 REMOVE COTTER PIN from seat-back pivot with pliers. For future convenience, replace it with a retainer bent from coat-hanger wire, as shown above. This snaps under bead of seat housing, out of sight but easy to reach. To facilitate removing seat backs, spring housing outward slightly with a lever.

2 DETACH SEAT BACKS by pulling toward outside of car to slip seat pins out of center-bracket holes (arrow). Then it's easy to slide the outer brackets off their pins.

3 MAKE TWO SUPPORTS from ¾" lumber, high enough to hold top of seat backs flush with rear-seat cushion. Front edges of backs rest on steel frame behind front cushion, which must be slid fully forward. Slip your shoes over brackets to avoid bruises.



Faced with the double dilemma of a stubborn woman and a stalling car, Gus pulls a fast one.

From up ahead, Gus heard a shrill female voice—it was Abigail Thornton giving her long-suffering husband the usual going-over.

Gus Gets a High-Pressure Job

By Martin Bunn

IT WAS dark when Gus Wilson left the movie and turned into the narrow alley that led to the parking lot. Suddenly, from up ahead, he heard a shrill female voice.

"I just can't understand you, Ned. You spend money like we were millionaires. The old one was perfectly good, but no, you had to go and squander hard-earned cash on a new one. And now look what you got. Tomorrow morning you're going to take it right in to those people and demand your money back . . ."

Gus didn't have to see the woman's face; he recognized the voice—it was Abigail Thornton giving her long-suffering husband, Ned, the usual oral going-over. In business, Ned Thornton was an aggressive go-getter—the town's top real-estate man—but when it came to Abigail he was just a timid soul. "Oh, I let her rant," he had once told Gus, rather sheepishly. "She seems to enjoy it."

As Gus got into his car he could still hear Abigail's strident tones piercing the night.

New Car Won't Quit Stalling

Gus had just finished checking the gas tanks at the Model Garage the next morning when a shiny gray sedan rolled up to a stop. Gus didn't recognize the car, but he knew the driver. It was Ned Thornton.

"Hi, Ned," Gus greeted him, sympathetically recalling the previous night's incident. He walked around the car, admiringly. "I see the real-estate business is good."

"Sure, sure," Thornton replied glumly. "The fact is, Gus, I just had to get a new car. The old buggy was eating up gas, and besides, you can't drive prospects around in an old beat-up jalopy."

"Well, you sure got yourself a beauty. Get a good trade?"

"Thought so when I made it. But now I'm not so sure."

"Why? What's the matter?" Gus asked him.

"Plenty," Thornton grumbled. "Ever since the 500-mile check she's been using even more gas than the old bus, and she stalls just about every time I stop in traffic."

"Had it back to the dealer again?"

"At least a half-dozen times. They've tested it and worked on it, and each time they've claimed there's nothing wrong."

"But they should make good on it."

"Oh, Gus, not you too," groaned Thornton. "Abigail's been needling me about that for days now. She—ah—objected to my spending money on a new car [Gus thought *that* was putting it mildly] but that's not the half of it. You know that big tract of undeveloped land that belongs to the hospital, out on the south road?"

Gus nodded.

Help Wanted—in a Hurry

"Well, one of the big steel companies is interested in it. Two of their top real-estate experts are due here on the 12:08 to look it over as a possible site for a new plant."

"Something big?" asked Gus.

"Big is right. They want at least a hundred acres. If I can put this deal over, it'll be a break for everyone—the hospital can use the money, and jobs for a couple of hundred people certainly wouldn't hurt this town."

"Plus a nice fat commission for Ned Thornton," Gus added with a grin.

"Right," Thornton agreed cheerfully, "and if I ever needed to make an impression and have things run smoothly it's today. Fat chance, though, with that," he added, jerking his head toward the new car. "I won't even be able to get those men from the station to the country club for lunch without stalling a dozen times."

Gus climbed into the car and started the engine. It caught easily and ran smoothly.

"Oh, sure, she runs fine until she warms

up," Thornton explained in answer to Gus's quizzical look. "Then the first time you slow down for traffic or stop for a light, she dies."

"What's the dealer's mechanic done on it?"

"Well, first off, he thought it was vapor lock, but he gave up on that. Then he checked the distributor and adjusted the points. Finally, he put on an entirely new carburetor—said the original one had a bad float."

"Make any difference?"

"Not one bit. That's why I've given up trying to get them to do anything about it. I'd rather pay you and get it done right."

Gus looked at his watch. "It's just 9:15 now," he said. "If you'll—"

"Holy smokes. Is it that late already? The Stevens boys are due at my office in 15 minutes. They want to look at the old Davis house."

"Well, hop in," said Gus. "I'll drive you down. It'll give me a chance to see how she runs. Then I'll bring it back here and try to find the bug."

The car performed beautifully on the way to town and Gus got Thornton to his office in plenty of time. "I'll do my best to have it for you by noon," Gus called after him.

Stop Sign Stops Engine

The trip back to the Model Garage wasn't quite so uneventful, however. At the first traffic light, the engine died. Gus had a hard time coaxing it back into action again. A few blocks farther on, when Gus braked for a stop sign, it died again. Under load it seemed to run perfectly—but idling, it had a definite tendency to choke up and conk out.

"Acts as if the choke were pulled all the way out," thought Gus as he pulled into the garage.

"Hi, boss," young Stan Hicks called as Gus cut the engine. "Whose new buggy?"

"Ned Thornton's," replied Gus. "It stalls every time you stop and I've only got till noon to try and find out what's wrong."

New Cars Are Tougher

Gus's hunch about the choke proved to be a dud. The carburetor seemed in top condition. A run-through of the ignition system failed to turn up anything either. And when Gus dollied his test rig up beside the car, Stan knew that the boss's hunches weren't paying off.

"Troubles?" he inquired.

"It's a funny thing, Stan, but I always hate to work on a brand-new car. With the old clunkers you generally know what to look for because you know what's apt to wear out. But on a new job, you expect everything to be perfect, so where do you look?"

Just as Gus finished hooking up the test rig and was about to start up the engine, the office phone rang.

In a few seconds Stan was back. "It's Mrs. Thornton, Gus. She wants to know if their car is here and when it will be ready."

"What'd you tell her?"

"I had to tell her it was here. She's still on the phone. Says she's got to have the car by 11 o'clock so she can drive to the city for a big bargain sale."

"Oh, blast that female!" Gus exploded, with unaccustomed severity. "Doesn't she know Ned needs this car if I can get it ready for him? Stall her off, tell her anything—tell her it won't be ready before late this afternoon."

Stan Encounters an Irate Wife

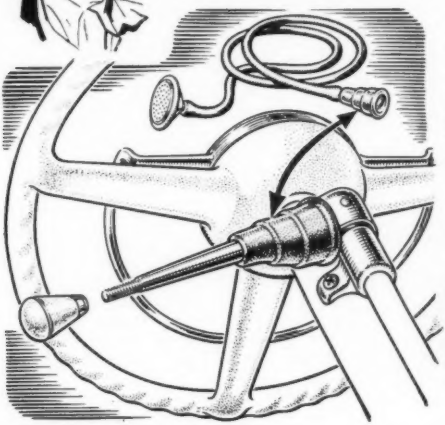
It was quite a few minutes later when Stan finally came back into the shop. He gave a low whistle. "Boy—can that old gal beat her gums! I couldn't get a word in."

"Did you stall her?" asked Gus without taking his eyes off the test gauges.

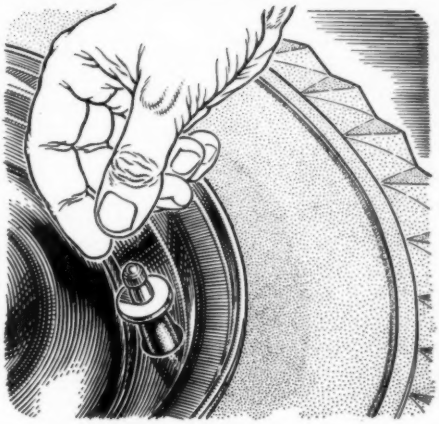
"Sorry, boss, I couldn't," replied Stan apologetically. "The last thing she said before she hung up on me was that she was gonna call a cab and come over and sit right here until the car was ready."

[*Continued on page 246*]

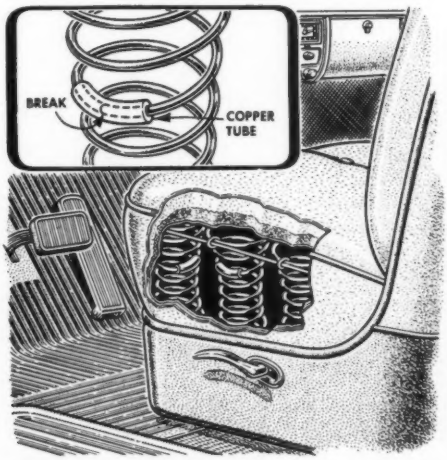
Hints from the Model Garage



Quieting a Gear Lever. In some older cars, a rattling shift lever on the steering post can be quieted by slipping on one of the rubber hose fittings that come with bathtub sprayers. Force it over the lever and against the steering column.



Washer Keeps Stem in Sight. If you have trouble preventing the valve stem from slipping back into the casing while mounting a tire, put a close-fitting washer on the stem and clamp it in place by screwing on the valve cap.

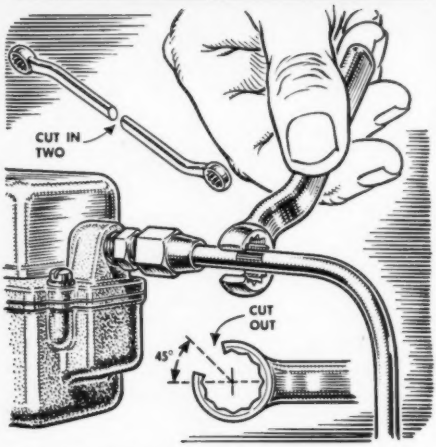


Repairing a Seat Spring. A coil spring in a car seat may break and let you down. But you can return the spring to service by forming a short piece of copper tubing to the contour of the spring and slipping it on the broken ends.

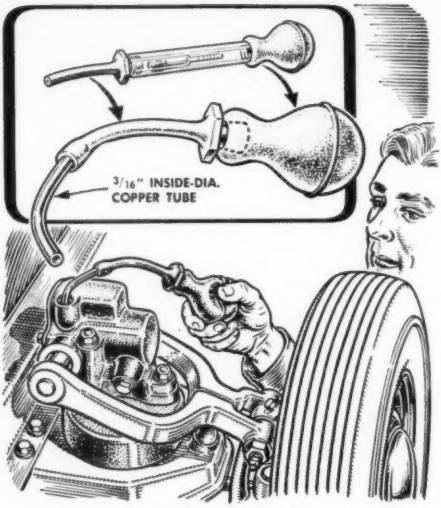
Hood Pad Protects Spotlight. If your spotlight swings to a position where the opened hood will strike it, pad the hood edge with a strip of rubber cemented in place. The hood then won't cause any damage if it accidentally hits the spot.

Please turn the page for four more auto hints.

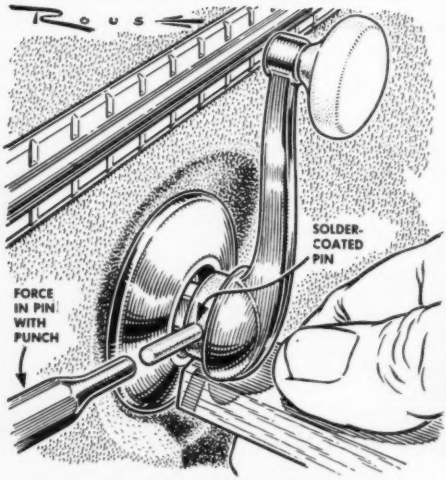
MORE Hints from the Model Garage



Two Wrenches from One. A pair of handy wrenches for work on fuel and brake lines can be made from a suitable-size box wrench. In each box, file a slot slightly larger than the tubing. The box will then slip down over the connecting nut. Cutting through the handle gives two short wrenches suited to work in tight spots.

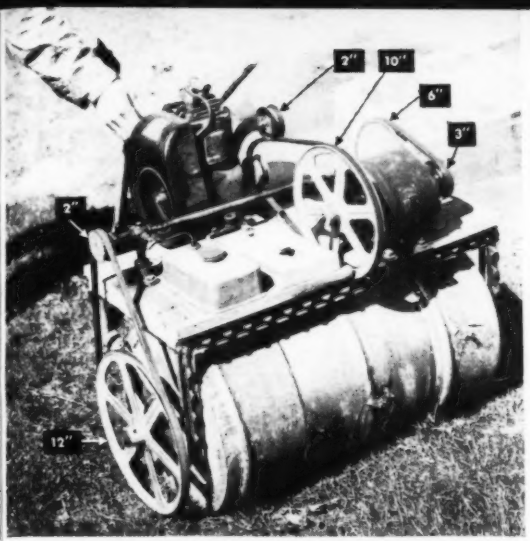


Tool for Filling Shocks. If the glass tubing of a hydrometer is broken, the remaining parts can be salvaged to make a tool for filling hard-to-reach shock absorbers. Slip the rubber unit from the tube bottom into the squeezing bulb. Force a short piece of copper tubing about ¾" into the rubber hose.



Solder Keeps Door Pin Snug. On most cars, a small pin holds each window crank in place. If a pin keeps falling out, dip it into molten solder for an instant. Then file or grind it down until it can just be forced into place.

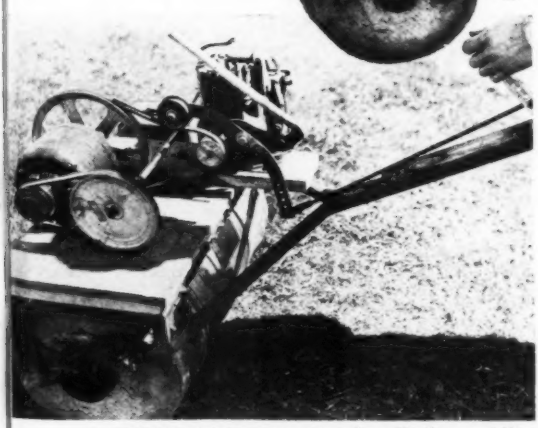
Battery Clamp Easier to Remove. A couple of fiber washers placed between the nut and clamp when you connect a battery cable should make the cable easier to remove later. The washers will help keep corrosion from freezing the nut to the clamp.



PULLEYS shown above step down engine speed and give ample power. Burned-out electric motor was used only to provide jackshaft bearings. Gas tank rests on wood platform.

Power Roller Won't Chew Lawn

Drum made in three sections pivots without dragging when you turn it.



CLUTCH LEVER on steering handle forces idler pulley against the primary drive belt. Steel fence posts were cut and welded to make frame. Drum ribs do not groove turf.

HERE'S a power lawn roller with a big advantage over most store-boughten ones. Because the drum is in three parts, you can pivot it without cutting up the turf.

Elmer Doelling and Bert Pettersen of Venedy, Ill., built it. A one-lung washing-machine engine drives the middle roller section. The ends free-wheel on roller bearings.

The roller was made from a steel drum, torch-cut into thirds and then filled with concrete. The driveshaft was cast solidly into the center roller. Before the cement was poured, spokelike pins were inserted in holes drilled into the shaft. This prevents slipping.

Tin sleeves were wrapped around the shaft before concrete was poured into the end sections. The sleeves were tapped out after the concrete had set. U-bolts fasten the frame to the outer races of the ball bearings at either end of the shaft.

How to Do Hand Sanding

By Edwin M. Love

SPLINTERS that lift up during and after planing can be kept flat by gluing them down. Clamp or nail on a block, with paper underneath, until glue sets. In gluing down edge splinters, string may be a more convenient means of applying pressure.

FIR PLYWOOD should be sanded with a hard block backing up the paper. Then both hard and soft grain are smoothed evenly. Before staining, soft woods should be wiped with a wet cloth, allowed to dry and then sanded. Wetting raises grain that would be raised by the stain.

There's more to it than just rubbing wood with sandpaper. As an expert does it, hand sanding becomes a real art.

"PHOOIE!" Sid Howell exclaimed.

He squinted at an unfinished cupboard door that he held so the light slanted across it.

"Hello," Chet Thompson called as he came down the stairs to Sid's basement shop. "I thought I'd drop in and . . ."

"Phooie!" Sid snorted again.

"What's all the disgust about?"

"I had a free evening," grunted Sid, "so I started to refinish this old door. Now look at it. Plane marks and sanding scratches all over it."

"That's a tough test you're giving it, Sid, when you light it that way. Turn it squarely to the light and you'll hardly see any defects. Here, let's check it."

Sanding Won't Make It Flat

Chet took the door and placed it on the bench. He rested the edge of a try square across the door. Slits of light showed under the blade.

"Those lighted spots show up grooves left by your jack plane," Chet said.

"I know it. I was just sanding them out."

"You don't sand things like that out of flat work," Chet explained. He was an old hand at woodworking. Sid, who had just moved into his new home, was relatively green at shop work.

Chet picked up a padded sanding block and moved it slowly over the surface. "Hand sanding smooths an established surface, but if the surface isn't flat to begin with, sandpaper isn't much help. It just smooths irregularities into gradual curves instead of taking them out. That's especially true with a padded block."

"I thought pads were a must."

Pads Can Help or Hurt You

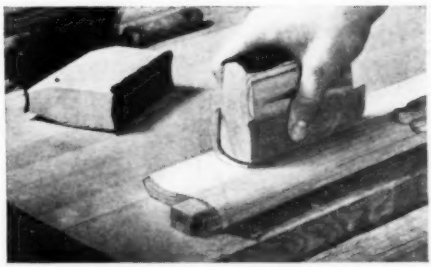
"Not necessarily. The padding pushes the paper into every hollow so it hits the low as well as the high spots. That's good for finish sanding; otherwise just part of the paper might do all the work and get clogged. But it isn't what you want for cleaning up rough work. Watch this and you'll see why."

Chet took a bit of fir plywood from the scrap box and worked it over with the padded block. Then he gave it to Sid.

"Looks as if it was etched," Sid grumbled,

CROSS-GRAIN SANDING can be avoided on framed panels by blocking off cross member with scrap. Be sure to sand all of panel.

PALM OF YOUR HAND makes an ideal backing for compound curves like hull of model boat.



SHAPED BLOCKS, faced with 1/16" felt, make sanding of moldings easy. Cove section of molding is being sanded above. Convex molding can be sanded with concave block.

SHARP INSIDE EDGE on molded or shaped stock is maintained by sanding with paper brought to edge of unpadded block, as shown above.

squinting at it. "The soft grain is scooped out, but the hard grain stays high."

"That's right," Chet said. "Now an unpadded block would tend to cut down the hard grain about as fast as it reduced the soft. You'd get a smoother result, and that's what you want here."

"Speaking of hard grain," Sid said, "look at this." He pulled a length of one-by-six from an overhead rack. One edge of the board was fringed with feathery shreds. "Those hard-grain splinters spring out from the edge as fast as I plane them off."

"That's one fault of fir," Chet said. "Quarter-sawed boards are nice, but the edges frequently act like that. Mix up some glue and I'll show you a trick I use."

While Sid mixed powdered glue with water, Chet examined the partially completed hull of a model ship that lay on the back of the workbench.

"Nice-looking hull," Chet commented.

"Thanks," said Sid. "It took a lot of elbow grease, and I want to ask you about that. Here's the glue."

Chet brushed glue under the splinters that stuck up along the edge of the one-by-six. Then he laid a strip of heavy paper over the edge and clamped the edge against another board.

"When that glue is dry," he said, "you can joint and sand that edge just as you would the edge of a hardwood board."

"A neat trick," Sid admitted.

"It helps. Now what was it you wanted to ask me about that boat hull?"

Two Ways to Sand Curves

"Well, I tried some fancy curved sanding blocks, but found my thumb and palm were better than any of them. Now I wonder if I was wrong."

"Not at all. Your fingers are pretty good for smoothing moldings, too," Chet said, "but special blocks are better if you have much of that work. Here, I'll make a couple to show you. Got a piece of molding handy?"

While Sid dug up a piece of molding, Chet selected a couple of blocks about 3″ wide and 5″ long. He rounded the edges of one of the blocks to ½″ and to ¾″ on the

UNDULATING SURFACE of a lamp base is first rough-sanded across grain with progressively finer paper. Finish sanding is done with grain, working from medium coarse to fine.

INSIDE CURVES can be sanded by using part of the sawed-out waste as a backing block. **Wrap sandpaper around block of waste, as shown in photo above, and move with grain.**

bandsaw. He made the second block with concave edges. Then he wrapped a piece of medium garnet paper around the block with rounded edges and stroked it along the cove of the molding that Sid had handed him.

"The block doesn't quite fit the curve," he said, "but it does well enough if I rock it as I sand. Of course, it could be padded out to fit the curve."

"I notice you prefer garnet to flint paper."

"I think garnet is better. It cuts faster and stays sharp longer. In the long run, I find it costs less to buy the garnet."

"By the way," Sid said, "I was so disgusted with that cupboard door when you came in that I wasn't paying attention. What was it you wanted?"

Chet looked up and laughed. "It's tended to now. Last week you asked me to stop by and . . ."

Sid's face lighted up as he remembered. "And give me some pointers on sanding," he grinned. END

ABRASIVE PAPERS

Flint papers are graded on a scale established long before modern ultra-fine abrasives were available; garnet, silicon carbide, and aluminum oxide abrasives are designated by a more recent and longer scale. A comparison of the grading systems follows.

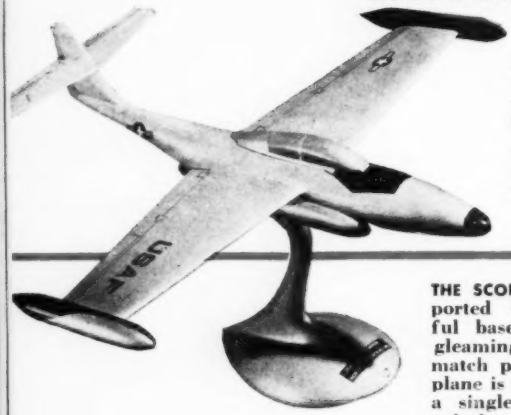
Source: National Bureau of Standards.

FLINT PAPER	GARNET, SILICON CARBIDE, ALUMINUM OXIDE		
Grade No.	Grade No.	Grit	
	3½	20	very coarse
	3	24	" "
3	2½	30	coarse
	2	36	"
2½			"
2	1½	40	"
1½	1	50	medium
	½	60	"
1			"
	0	80	"
½			"
	2/0	100	fine
0			"
	3/0	120	"
2/0	4/0	150	"
3/0	5/0	180	"
4/0	6/0	220	very fine
5/0	7/0	240	" "
	8/0	280	" "
	9/0	320	" "
	10/0	400	" "

FOR YOUR POPULAR SCIENCE INFORMATION FILE

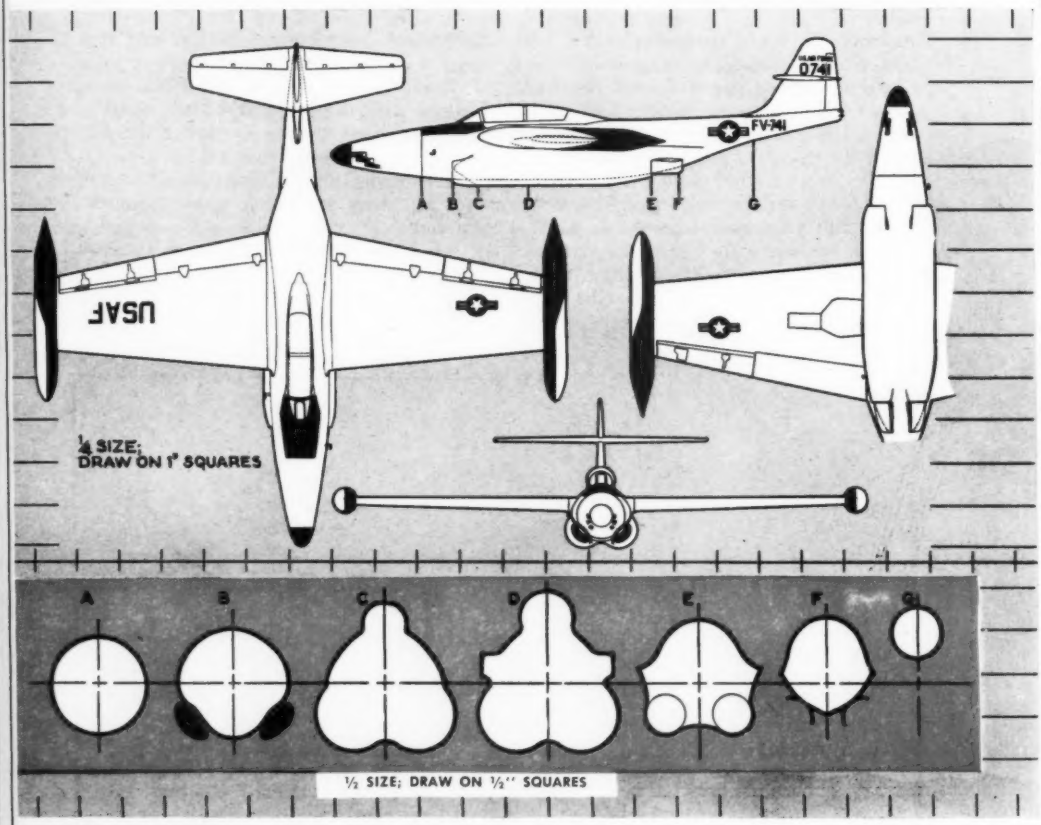
Carving an F-89 Scorpion

Here's a slick model of a terrific airplane—the Air Force's latest all-weather interceptor.



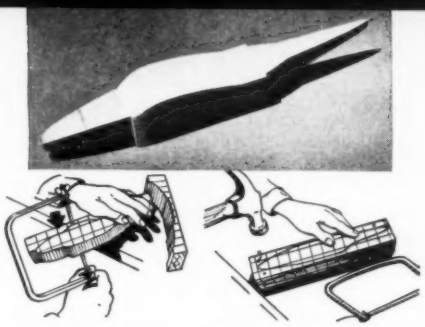
EVEN grounded on a desk, the Scorpion symbolizes power. In the air the prototype of this super blowtorch can streak to an eight-mile altitude, play tag around the sonic barrier and chop down enemy aircraft with a few murderous bursts.

THE SCORPION is supported by a graceful base finished in gleaming aluminum to match paint job. The plane is mounted with a single screw after painting in markings.

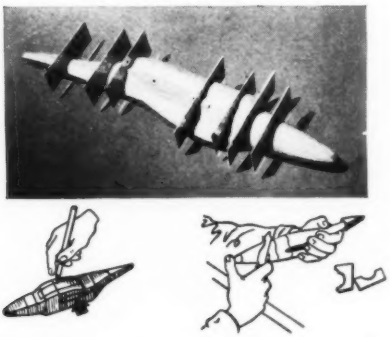


Its clean lines make it a nice ship to model for your mantel or desk. Enlarge the plans on the facing page to double size for the templates and four times for the other views to get a 1/50-scale model that's about right for a desk.

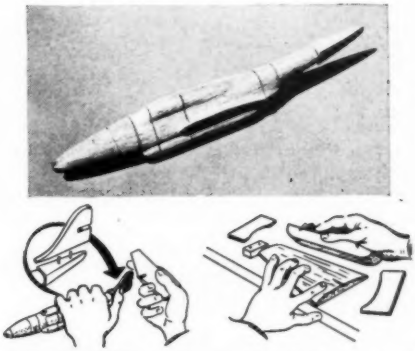
Good finish is vital. Seal the wood with shellac and follow with two coats of auto primer-surfacer, wet sanding after each. Spray on several coats of thinned aluminum dope and, using masking tape carefully, paint on the windows, control surfaces and markings.



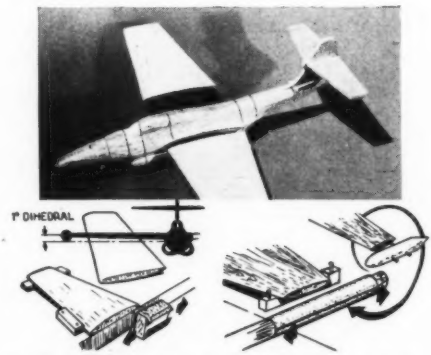
BODY is cut from a solid block of white pine or balsa. Draw paper profiles on 1" squares and paste them on side and top, aligning center lines. After cutting side profile, tack waste parts back in place and cut top view, forming a rough contour block.



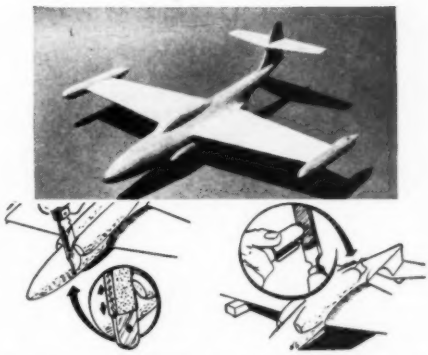
TEMPLATES, cut from tin or thin plywood, are a must for shaping body. Draw half of each lettered body section on ½" squares to enlarge them to scale size. Mark station points and outline the canopy, wing roots and engine bays on the block before carving.



TAIL ASSEMBLY, cut from ¼" stock, is glued in place after body has been roughed down to its approximate shape. Small block is used to fill stabilizer slot after assembly. Wings are shaped from ½" stock, using the two wing templates to produce the camber.



DIHEDRAL is obtained by blocking up wing tip and rubbing square sanding block on butt end. Support wing tips when gluing. Tip tanks, turned from dowels, are attached with glue and pins. Fit wing tips to tanks by rubbing with a sandpaper-wrapped dowel.



SMOOTH ALL SURFACES with sandpaper and fair in wing and rudder joints. A strip of sandpaper wrapped around a hacksaw blade is used to finish the gutters between the air scoops and fuselage. Tin blast deflectors are shaped on dowel and forced in place.

Solder "Galvanizes" Metal

If a welding job has damaged some galvanizing, you can fix it up with this solder. It can be applied with a torch or iron. According to the maker, Farrelloy Co. of Philadelphia, a careful repair leaves no line of demarcation between the solder and the original galvanizing.

Yardstick Baby-Proofs Drawers

I got tired of picking up after baby's treasure hunts through the kitchen drawers, so I used a yardstick—on the drawers, not the baby. Pushed down between the handles as shown in the photo, it effectively keeps baby out, yet is quickly removed by adults. *—Grover Brinkman, Okawville, Ill.*

TOOLBOX TEST

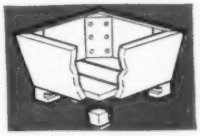
Sharpen up your knowledge of shop tools. Name these and invert the page to score yourself.

By C. B. Colby

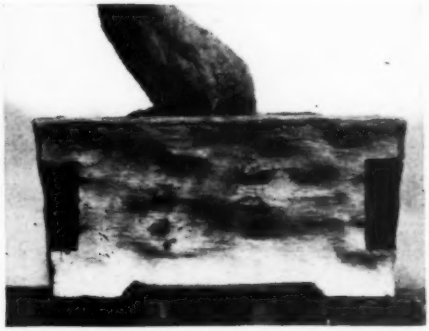
1. Nail pullers; 2. cam-locking pliers; 3. hacksaw set; 4. alcohol torch; 5. curved-tooth file in holders; 6. spoke shave.

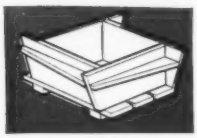
Tubs for Shrubs

Build your own of redwood, cypress or cedar. Lighter than ceramic pots, they won't be cracked by a sudden freeze. Instead of painting them, you can just let weather mellow the wood.



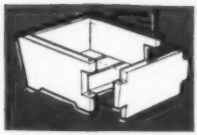
HOPPER JOINTS in the tub at right and left are best cut on a circular saw. This and the other designs were developed by California Redwood Association.

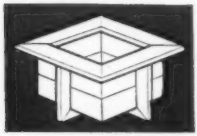




SHELVING board or 1″ stock is used for this tub. The design looks tricky to build but it is nothing more than a hammer and handsaw project.

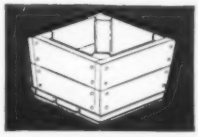
DRIFTWOOD finish. Lumber 2″ thick has been sandblasted for a pleasing effect. Interlocking corners are doweled together. Bottom is nailed on.

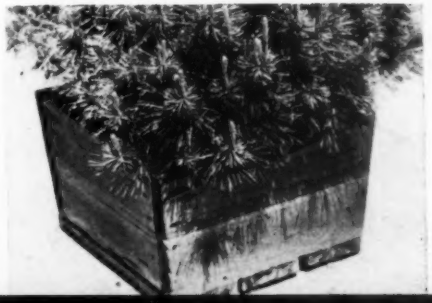


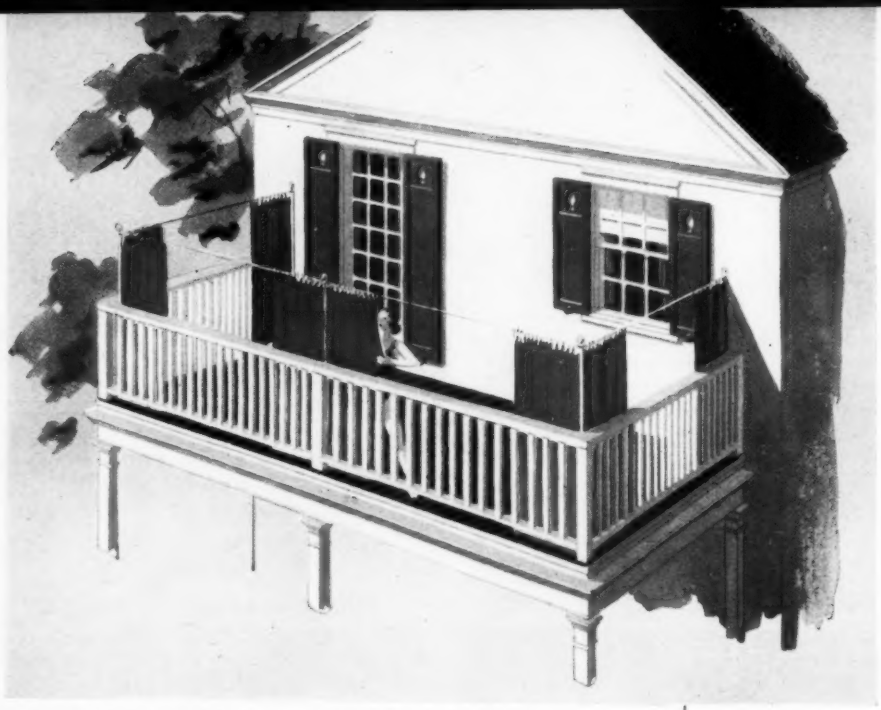


MODERN box is made from 2″ redwood. Putty over the nails to prevent rust stains, or else use galvanized nails. Drill drain holes in bottom.

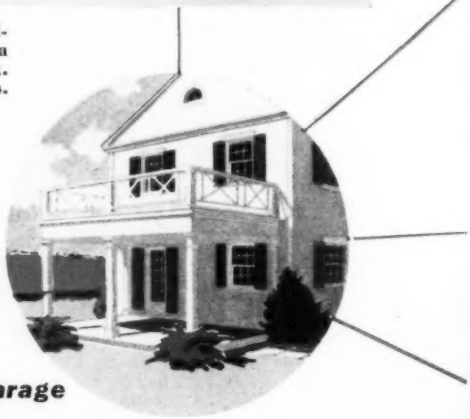
RUSTIC in its crudity, this square tub with slightly tapered sides blends into a garden. One-inch stock is used. Space bottom slats for drainage.







PRIVACY FOR SUN BATHERS. A railing and curtains riding on heavy galvanized wire convert this deck to a solarium. Small drawing at right shows typical deck. Other ideas are suggested on the next three pages.



5 Ways to Use a Porch Roof

Wasted space above a porch or garage can be put to work to make your home more comfortable. Here's how you can do it.

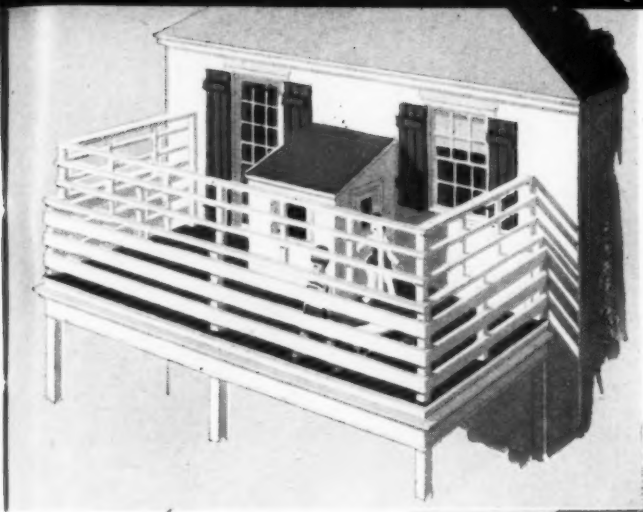
TOO often a garage or porch roof is only a cover for the area beneath it. Yet the flat-roofed type—called a deck—is a ready-made beginning for extra living space. Your modifications can range from a simple sun deck to an additional room.

To put a deck to use, you will have to open a door onto it, lay a floor and put up a canopy or roof. Opening a door is not difficult if a window overlooks the deck—and that usually is the case.

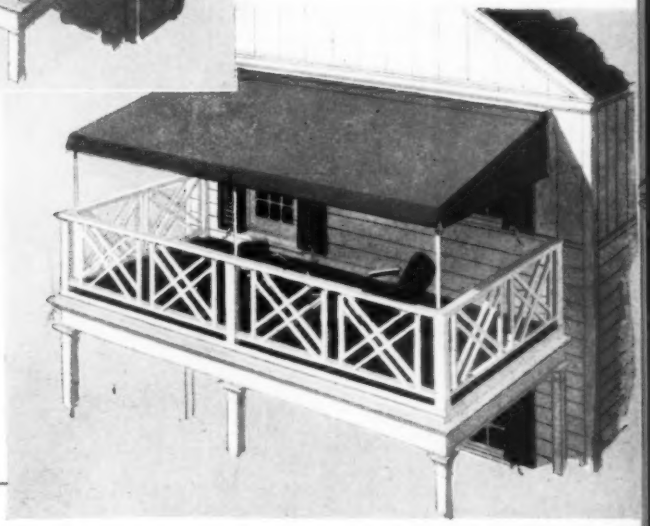
A floor built like a duckboard—slats nailed to wide boards—will do if you only want the deck for sun bathing. For the permanent installations, however, a complete floor will be necessary.

Sun deck. If you are only looking for a spot to sun yourself, you can simply put up curtains. Screw pipe flanges to the deck to take lengths of 1¼″ by 5′ galvanized iron pipe. You can cut the pipe with a hacksaw or buy it cut to 5′ lengths.

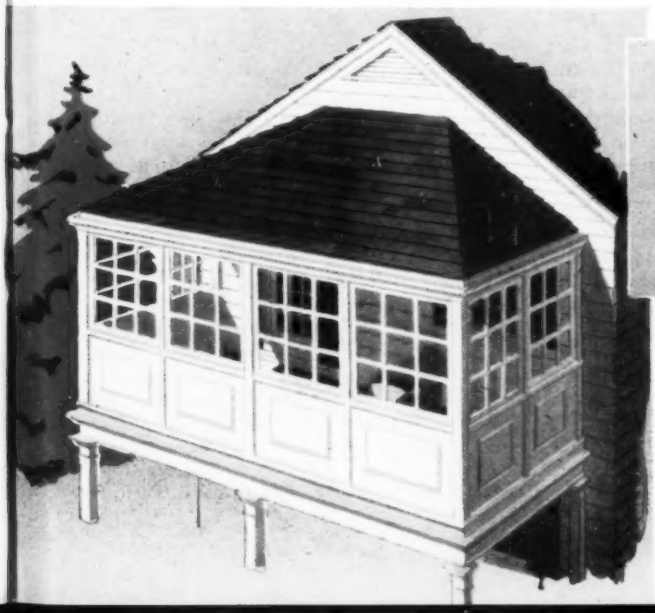
Drill the top ends of the pipe for the heavy galvanized wire on which the cur-



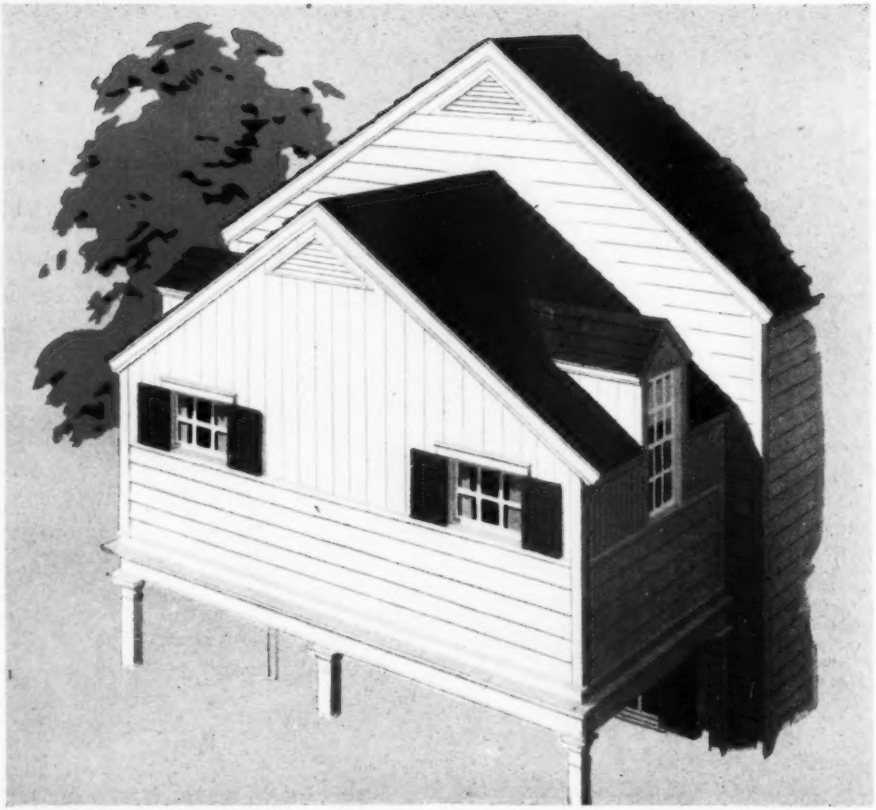
PLAY AREA FOR CHILDREN. Fenced in higher than the average porch railing, a deck like the one at left forms a sunny, open-air playroom for children. A play house built on the deck will help keep them busy.



SHADY AREA FOR RELAXATION. If you like to take it easy outdoors in the summer but don't like the direct sunlight, this is for you. Canvas canopy is supported by framework of 1″ pipe. Framework should be made so it can be taken apart for winter storage.



ENCLOSED PORCH. This is a permanent improvement that will increase the size and value of your home. Double sash provide good winter insulation and still permit ventilation. In summer, outer sash are replaced by screens (above). Inner sash are hooked up against ceiling.



SPARE ROOM FOR GUESTS. This is the most ambitious deck improvement—converting it to a spare bedroom. In this design, there is space for twin beds along the long wall with the small windows. Dormers at each end provide additional light and cross ventilation.

tains will ride. Fit the pipes in the flanges and then tie each pipe to a post or the house with pipe straps. Use wood screws to hold the straps to the posts and house.

Adding a room. The first thing to do is find out if the deck and its supports are strong enough to carry the additional load. Possibly the best way to do this is to check with the man who built the house or with the architect. Points to consider are the columns under the deck, the girders and the joists.

Another matter to be planned first is the method of heating your new room in winter. If you have steam or hot-water heat, a new radiator and a connection to the main system may be easiest. In other cases either electric radiant-heat panels or floor- or wall-type space heaters may be preferable.

Finally, don't neglect checking with the local building office in your town. Many communities require building permits for improvements.

Start with the floor. Tear off the old deck covering. Spike two-by-fours on 16″ centers to the joists. Drill the two-by-fours for any conduit you might want to run under the floor. Then lay batt insulation or loose fill between the two-by-fours. Run conduit and nail down the subflooring at 45° to the two-by-fours.

Lay two-by-four sole plates along the outside edges of the deck. Locate the framing in the wall of the house and remove the siding and sheathing to expose the framing members of the house wall. An easy way to cut away sheathing and siding is with a portable electric saw.

Now erect the two-by-four studs and top plate. Set the studs on 16″ centers. Use

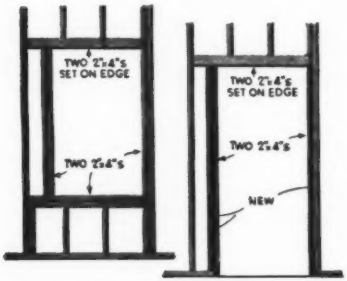
four-by-fours or double two-by-fours at the corners. When setting the studs, allow for window openings. At this point, put two-by-four fire stops between all the studs.

Let-in bracing is necessary to give the framing rigidity. One-by-fours usually are used. Start the one-by-fours at a corner at the top of the studding. Run them as near 45° as possible between the top and bottom plates, passing under windows.

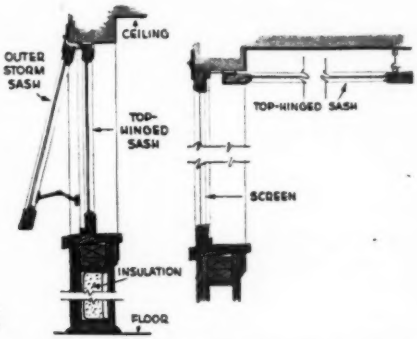
Putting on the roof. Lay out your joists and rafters so they can be spiked to the sides of the house framing. Next nail roof boards to the rafters and sheathing to the studs. At this point it's a good idea to put down building paper, install flashing at the joint between roof and house, and nail on the finish roofing. Then your almost-finished room will stay dry if it rains.

Frame around the windows, using double two-by-fours at top, bottom and sides. Don't forget the short studs under the bottom header and over the top header.

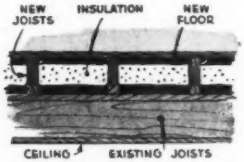
Nail building paper over the sheathing and put on the siding. Then you can install windows. Staple batt insulation between the studs and run any wall conduits to outlet boxes. Finish the interior with plywood or wallboard.—*Carl T. Sigman and William Ward, Jr.*



WINDOW that overlooks deck can be converted to a door. Framework of window probably looks like this (left above). Remove window, take out sill and supports, then install door buck (right above).

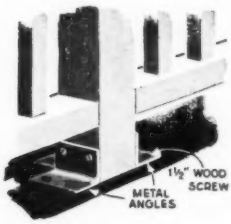


DOUBLE-SASH WINDOWS for an enclosed porch can be built like this (above). Storm sash is not hinged at top but is hung on hooks. Best bet is to design your window openings to take standard sash.



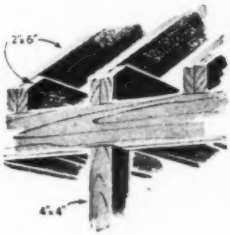
PERMANENT FLOOR for a room can be laid like this. Set two-by-fours on 16" centers at right angles to existing joists. Install insulation between new joists with vapor barrier on upper side.

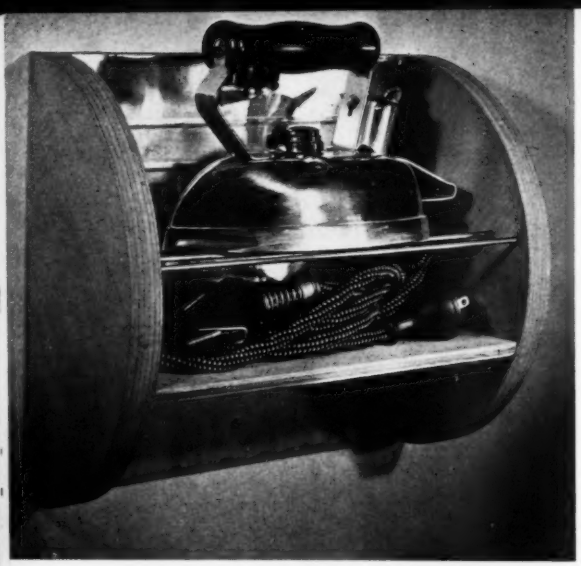
TEMPORARY FLOOR for a deck can be made with one-by-twos or one-by-threes nailed to wide boards. Floor is necessary because decks usually are covered with roofing that would be injured if walked on regularly.

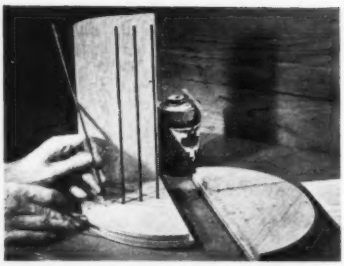


POSTS FOR RAILING can be secured with wide metal angles (left). Try to locate angles over joists below sheathing. Also use angles to join rail to house.

FRAMEWORK OF ROOF for enclosed porch should be built like this (right) because of wide stud spacing. For extra room, two-by-four studs can be used.







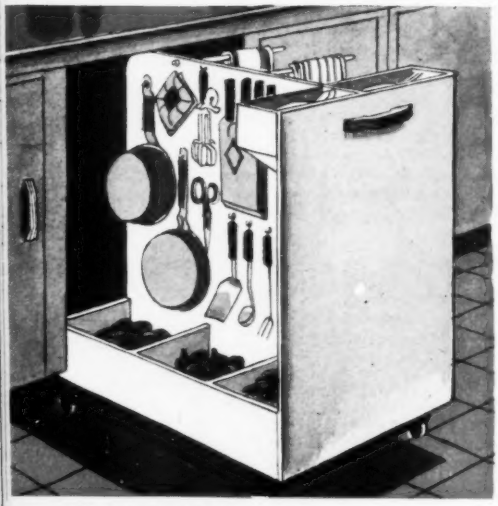
A PRESSING IRON is usually put in one place to cool and then stored someplace else. But this rack holds it hot or cold. The semicircular ends are ¾″ plywood. They are joined by a ¼″ plywood back and lower shelf and by five pieces of curtain rod that form a shelf for iron. Tin-can metal tacked to back panel keeps heat from wall.

Special Racks Speed Kitchen Jobs

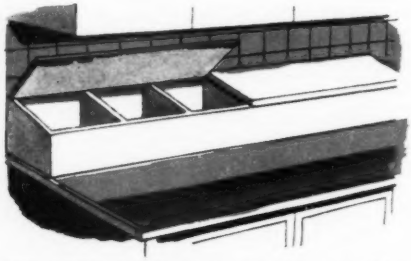
IN THE kitchen, extra steps quickly add up to a walkathon. Time wasted in hunting tools and utensils can make meals late and tempers short.

These racks keep things where they belong, rather than jumbled in drawers or booby-trapped on cluttered shelves. Each serves a special purpose, looks shipshape and makes good use of space.

In working out your own, remember two rules: store things near the place where they're used, and keep accessories near the gadgets they belong to. Electric-mixer blades aren't useful in the broom closet.



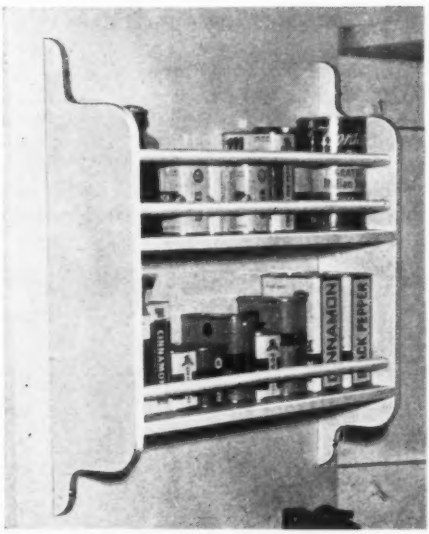
POTS AND PANS are easier to find when hung on an upright panel. This one slides under the counter, has room for tools, towels, bins.



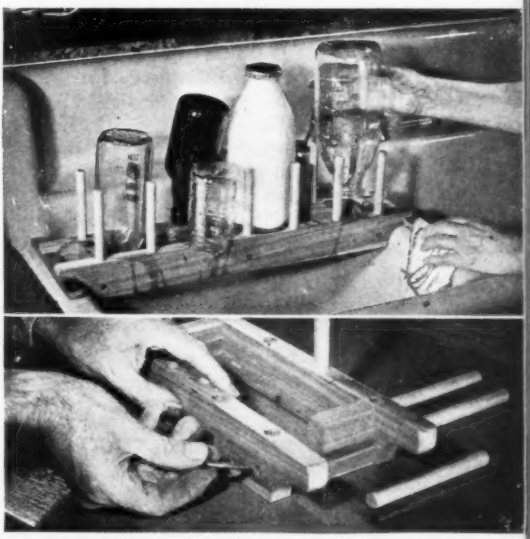
THE SMALL STUFF—mats, coasters, napkin rings, corks and all the other midget hardware housewives collect—can be kept handy in small bins at the back of the work counter. A row like this (above) can be built as a unit, divided to fit selected items.

STIRRING SPOONS belong at stove side, but they drip. This rack keeps them there and has an aluminum drip tray that's easily removed for cleaning—two holes hook over screws in the plywood back.

A ROLLING PIN can be an attractive piece of kitchen equipment, and this rack makes the most of it. The notched lower shelf holds an assortment of larger tools that usually get tumbled into a utensil drawer.

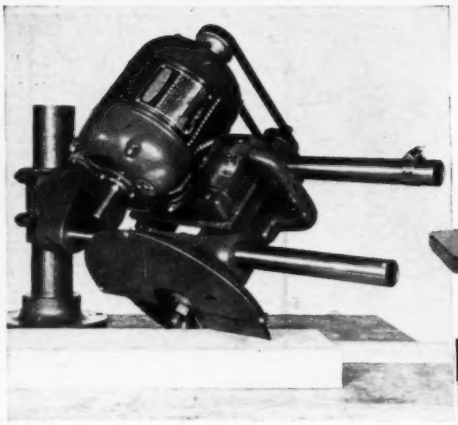


SMALL SPICE CONTAINERS don't have to hog space on a big shelf. This two-tier miniature, made from scrap plywood and dowels, can be tucked away on the inside of a broom-closet or cupboard door or on any small wall space. If it is placed on a wall, the retaining dowels that run across the front aren't needed. The unit is about 14″ high and wide and 3¼″ deep. It is assembled with glue and finishing nails.



BOTTLE DRAINER takes the overload off the regular dish-drying rack. Designed to bridge a sink opening, it has ends shaped to fit the sink it will be used with. Outrigger strips across the ends keep the rack from tilting under heavy, leaning bottles. The dowels are centered 2¾″ apart to fit a common type of square milk bottle. Any wood will do, but the darker hardwoods won't discolor so fast. The rack should be left unpainted.

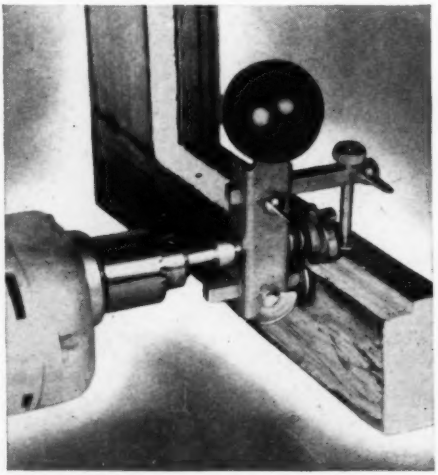
New Tools

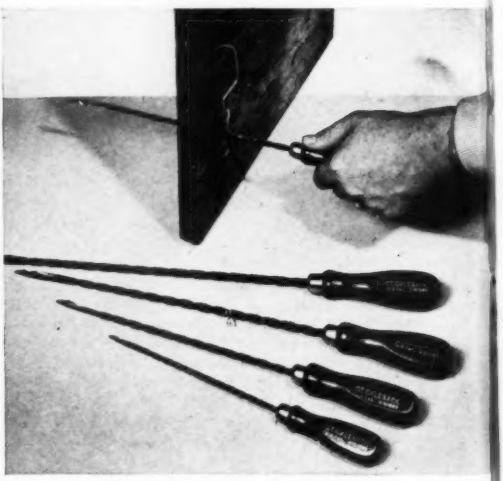


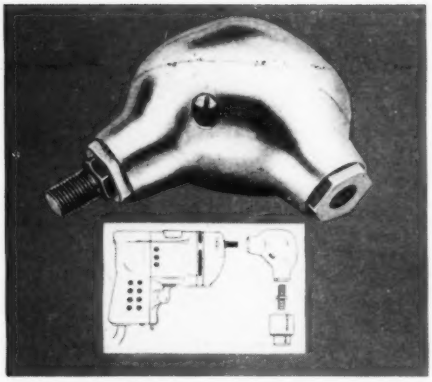
Radial Saw Fits Drill Press. This saw can be set up on its own column (left) or fitted on any 2¾" drill-press column (right). When not in use it can be swung aside out of the way of the drill press. Designed mainly for cut-off and dadoing work, the Mitermaster will also rabbet, plough and shape. It will take 10" blades and has a maximum cross-cut travel of 15". The basic tool costs $65, less motor, saw blade and belt. Weight without motor is only 50 lb. *R. W. Hendrick, Marblehead, Mass.*

Drill-Powered Tool Removes Putty. The tedious job of cleaning out the old putty when replacing window panes is mechanized by this attachment for any electric drill. The Putt-Y-Ank cuts the hard putty away. It can also be used as a grooving tool. Depth and width of cut are adjustable. *Uprite Glass Cutting Device Co., Chicago.*

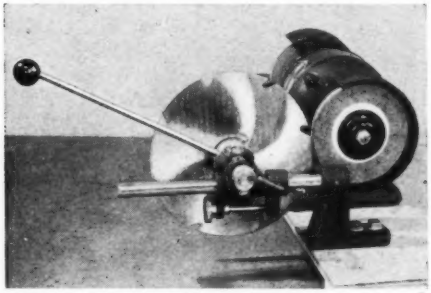
Saw Drills Own Starting Hole. The point of the Drilsaw is a gimlet for boring a starting hole. Then the spiral-toothed saw blade takes over to cut any size or shape hole. It's made in four sizes: 3/16" drill, 7" blade; ¼" drill, 10" blade; 5/16" drill, 13" blade; and ⅜" drill, 15" blade. *Colonial Merchandise Co., Hamburg, N. Y.*



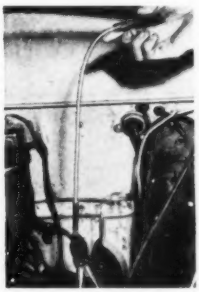




Right-Angle Drive for Drill. One end of this 90° drive fits directly on a ¼"-drill spindle while the other end takes the chuck. Turning the unit end for end changes it from a 1-to-2 speed reduction to a 2-to-1 increase. *Babcock and Co., Oakland, Calif.*

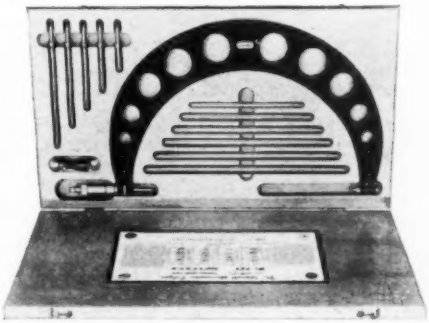


Sharpener for PTI Saw Blades. A sharpening attachment (above) for PTI blades sets up the blade in the same plane as the grinder and then locks it in position for correct grinding of each tooth. The attachment takes blades from 5" to 16" in diameter, regardless of the size of the arbor hole. *PTI, Inc., New York City.*



Magnet on Flexible Shaft. A permanent magnet on the end of an 18" flexible shaft makes it easy to retrieve small tools and parts from inaccessible spots. At left the tool picks up a pair of 12-oz. pliers. *Airborne Sales Co., Culver City, Calif.*

Workbench Folds into Cabinet. This combination cabinet-workbench is designed for the hobbyist who wants a shop in a small space. When not in use, it can be locked up—the lower part has doors, and the bench folds up to close the top section. It has adjustable upper shelves, four electrical outlets, a working surface 35½" by 47" and is 20" deep, 49" wide and 73" high. The unit is made of wood and hardboard. *Houghton Products, Los Angeles.*



Expandable Micrometer. Six interchangeable anvils give this micrometer a range from 6" to 12". Wrenches are included to make adjustments. The manufacturer also makes similar micrometers in ranges up to 24". *L. S. Starrett Co., Athol, Mass.*

Anybody Can Milk a Cloud

CLOUD-COOLING CHAMBER made at home lets you watch formation of man-made rain and snow. Flashlight makes ice crystals visible inside chamber. Materials you need are spread out in inset (left). Piece of dry ice can be taken from an ice-cream package.

Here's how you can produce a tiny April shower in your kitchen.

DO YOUR friends scoff at rainmakers? Then lay a small bet with them that you can produce an experimental shower.

Although the experts are still arguing about how much rain—that would not have fallen anyway—has been drawn out of clouds, it's easy to demonstrate what the rainmakers do. You don't need fancy equipment: a chunk of dry ice from the drugstore, two tin cans, a towel and a bowl of ice cubes will suffice.

How rain forms. Raindrops and snowflakes begin as minute ice crystals in a cloud cooled below freezing. If the cloud temperature is far below zero, at least minus 31°, the crystals form spontaneously. If the temperature is higher but still below freezing, natural dusts or "sublimation nuclei" are needed.

The rainmakers' trick is supplying artificial nuclei. Dry-ice pellets dropped through supercooled clouds freeze droplets that they pass. Or silver iodide "smoke" provides microscopic particles around which ice crystals form. Moisture then freezes on the ice-crystal "seeds," causing them to grow until they are heavy enough to fall. Whether they continue as snow or melt to rain depends on the temperature below.

Make a cold chamber to see how this works. Use a tall 46-ounce fruit-juice can for the outer casing, a tall 12-ounce can for the chamber itself. Fill the space between the cans with a mixture of three parts of cracked ice and one part salt.

Now breathe into the cold chamber. Your breath's moisture will instantly condense into a cloud of microscopic water droplets. Then drop in dry ice.

Now you see it! Shine a flashlight into the chamber. In a few moments you will see a myriad of tiny ice crystals sparkling among the droplets. Breathe again into the chamber—this time *gently* to avoid melting the crystals or blowing them away. The new moisture will quickly freeze around the crystals. If you repeat this operation, several minutes apart, the crystals will become large enough to fall to the bottom of the can as tiny flakes of snow.

1 INSULATE TALL CAN by wrapping folded towel around it with excess under bottom. Rubber bands will keep towel in place.

2 PAINT inside of smaller can flat black so you can see crystals forming. Then place small can inside large one.

3 PACK CRUSHED ICE in space between two cans, mixing rock or table salt with ice. This will cool your tiny cloud.

4 BREATHE gently into can after letting air inside cool several minutes. White cloud of tiny water droplets will form.

5 SEED CLOUD by scraping a few specks of dry ice into it with a nail. To avoid "burns," hold dry ice in paper or cloth.

6 WHAT YOU SEE. Flashlight reveals tiny ice crystals floating in cloud. These are first stage of rain and snow. END

TOO LITTLE AND TOO LATE. Although her home was beyond saving, this woman was still trying when Joe Goulart of Wichita, Kan., snapped the picture. The water came from a hand pump in the yard. The picture won honorable mention in a nationwide contest for fire photos.

How to Photograph a Fire

Press cameramen show you some of their best shots. Yours can be as good if you make the most of a real chance when it comes along.

LIKE fire itself, the chance for a good fire photo may come without warning. But this month the odds go up. For the country as a whole, March is the month in which fire losses are liable to be highest.

When fire occurs, the photographer has to be ready for the long shot. Consider the case of Joe Goulart. Joe works for the *Wichita Eagle*. Scouting through Kansas one day for pictures of tornado damage, he never expected to bring home a top-notch fire photo.

As fires go, the one he happened upon that day didn't amount to much. A small, one-story house. But frantically pumping water and carrying it to the flaming house was a lone woman. A one-woman bucket brigade.

Timing is vital. Goulart focused his Speed Graphic, set the shutter at 1/200 second and the aperture at f/8, pulled out the slide and waited to shoot. Not too soon. Not too late. But just as the woman threw the water. His picture and others on these pages were selected from scores

WHOOSH! David L. Pennycuff of the *Indianapolis Times* shot just as a tank of gasoline blew up during this fire. Good timing caught dense smoke and flames mushrooming up.

of photos entered in a contest the National Press Photographers and National Fire Protection Association sponsor annually for the best fire photos.

Add pathos, too. These pictures illustrate a rule that applies to all photography—it is just as important to know *what* to shoot as *how* to work the camera. Although each one was taken at a fire, notice the variety. Rampaging flames make a good picture, but add something else—a bit of human action, for instance—and you usually get a better one.

THE HERO. Pausing during his general coverage of an apartment-house fire, Hank Murphy of the *Hartford Times* snapped what appeared to be just a good human-interest picture—a burned dog in a fireman's arms. But Jackie the chow turned out to be a hero of the fire, and the photo got top billing. Jackie's barks enabled all to escape.

A DREAM IN ASHES. The home that Dewey Roy was building in his spare time was nearly finished. The evening was cold. To warm his hands, he started a fire in an empty pail on a concrete block inside the house. Roy slipped, a piece of lumber knocked over the pail, and the house was afire. It was gone when Joe Winters, assigned by the *Birmingham News*, got to the scene. But someone said Roy's wife was on the way. When she ran to her husband, Winters was ready. Here is the unposed photo he shot.

A HOSE PATTERN always makes an effective picture. Durwood Hayes of the Dallas *Times Herald* made this one at three a.m. by time exposure. Floodlights being used by a TV cameraman in background silhouetted firemen.

VOLUNTEERS. When fire comes to a small town, everybody pitches in. Here is a scene F. J. Cleverley of the *Winnipeg Free Press* found in a Manitoba village, where exploding oil drums were endangering nearby buildings. Member of bucket brigade caught running full tilt at right makes shot dramatic. Volunteers at left try to get equipment working.

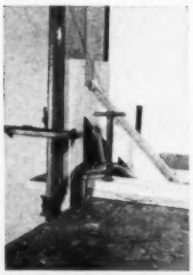
Rope Trick Stops Raveling

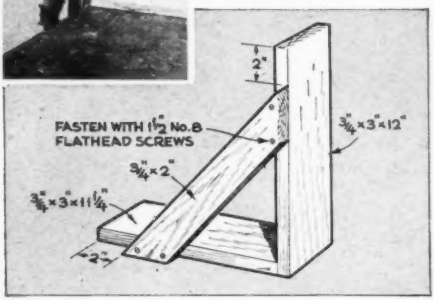
You can get rid of those horse's-tail rope ends. Temporarily bind the end with tape, and form the starting end of the whipping cord into a loop, which is laid along the rope. The cord is then wound over its own loop a dozen or more turns and the end threaded into the eye. A tug on the free end of the loop pulls the eye and the end under the winding. Trim the projecting cord ends and dip the winding in varnish.

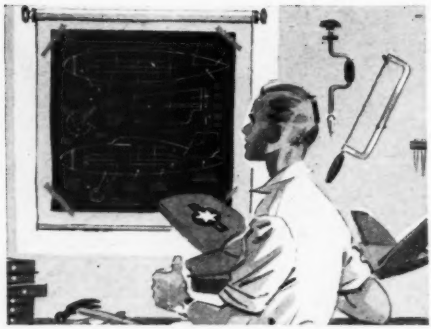
The trick is equally useful for other cord-binding jobs, such as tying ferrules on a fishing rod or wrapping handles with twine.

Homemade Jigs Simplify Gluing

The construction of furniture often involves gluing two fairly large parts together at right angles, usually with a rabbet or a blind mortise-and-tenon joint. A pair of jigs made of scrap hardwood fastened together with screws, as shown in the drawing, simplifies the job of clamping the two pieces together.—*Dean Keach, Fairview, Ill.*



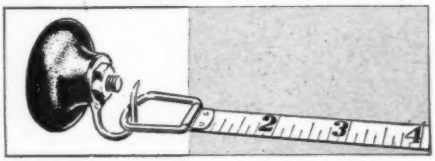




Plan Taped to Shade Rolls Up

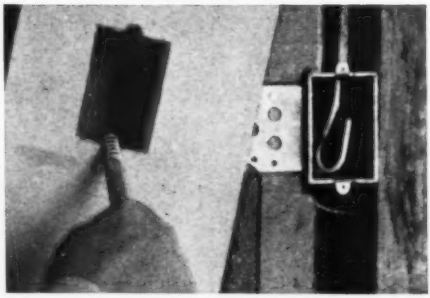
Blueprints mounted on a window shade in the shop can be rolled up to get them out of the way when you don't need them. The shade can be attached to a wall as shown in the drawing, or suspended from the ceiling. —*George Kapitan, The Bronx, N.Y.*

Suction Cup Anchors Steel Tape



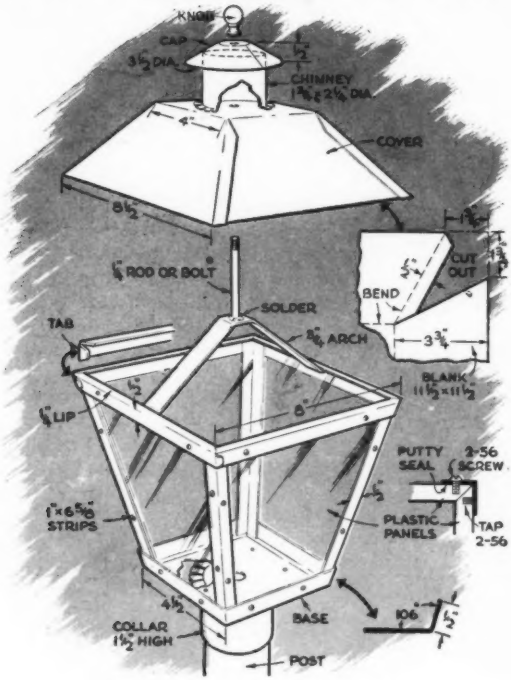
One man can measure floor space with a long steel tape by using a suction cup with a hook to hold the end of the tape. Correct the measurement by adding the distance from the wall to the beginning of the tape. —*John C. Polasek, Cudahy, Wis.*

Bolt Files Gypsum Board



The threaded end of a ½" bolt makes a fast-cutting file for gypsum board. The bolt is just the right diameter for cutting out half circles that fit snugly around the tabs on outlet and switch boxes.—*W. G. Waggoner, Sacramento.*

Post Lantern Has Plastic Panes

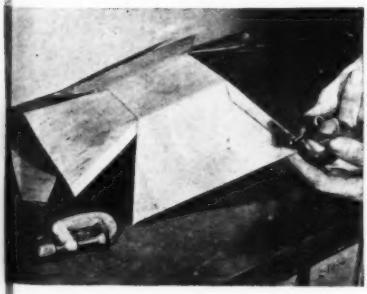


Shatterproof panels on this light are safe from slingshot missiles.

A POST lantern by your front walk, or a pair of them marking your driveway, makes a friendly welcome to visitors. Here is one you can safely mount where it will do the most good—right at the street line and not too high—because its plastic panels have little to fear from stones or air-gun pellets.

The lantern follows a design handed down from early-American times. Most of its forebears were made of brass. Although you can make a duplicate from any non-rusting metal, brass is still a good choice because it is easy to cut, bend and solder.

Lower section. Cut a sheet 5½" square



CLAMP THE SEAMS of the bent-up cover (left), make sure the unit is square, then rivet and solder the corners.

RIVET AND SOLDER the uprights into the cross-frame members and into the corners of the base pan (right). Adjust the angle of each corner so that the lower section of the lamp flares out symmetrically from the base.

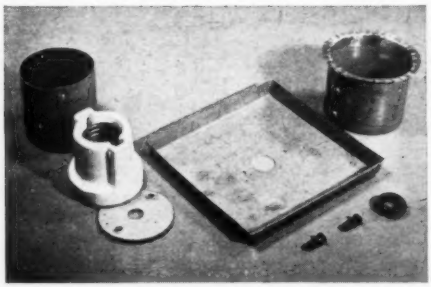
for the base and punch holes for drainage. Miter the corners and bend up a ½″ rim all around to an angle of about 106°. Make the upright angle strips from 1″ by 6⅝″ blanks. Make the horizontal strips from blanks ¾″ wide and a little over 8″ long. Angle them as shown in the drawing detail and leave a small soldering tab on one end of each strip. Cut out a fifth ¾″ strip and bend it into a flat-topped arch. Use a band at least 1½″ wide for the mounting collar and shape it to a snug fit on the post to which the lantern will be fastened. Assemble the lower section as a unit. Use rivets where possible and solder the joints for extra strength. Flow solder on liberally—you can file the rough spots down later.

Upper section. The metal blank from which the cover is made measures 11½″ square. Cut out the four corners as shown in the drawing detail and bend the sloping sides.

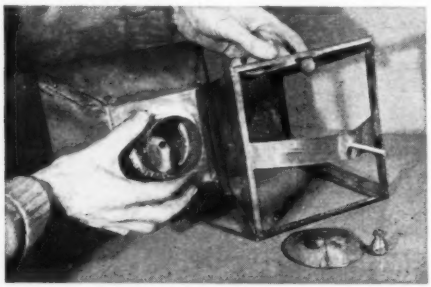
The chimney, a short cylinder used mostly for decoration, is covered by a saucer-like cap. Make the cap from a 3¾″ disk by cutting out a pie-shaped segment and bending the disk into a shallow cone. Cut off the peak and solder a washer to the top.

Glazing. The transparent lights or panels in the lower section are ¼″ acrylic sheet. Make cardboard templates of the four sides. They should be practically identical. If they are not, bend the metal frame until the openings are the same size and shape. Cut out the plastic panels and miter the vertical edges to 45°. Drill and tap the plastic for small roundhead screws.

Wire the lantern to a house circuit with cable approved for underground or outdoor use. If the wire has to travel through exposed places, it is also a good idea to fuse the line independently of the house-circuit fuses. Lamps of 60- to 100-watt size will fit the lantern nicely and should give just about the right amount of illumination.—*Walter E. Burton, Akron.*



BASE IS A SHALLOW, BENT-UP PAN. Collar (right), shaped to fit post, is flanged so it can be riveted and soldered to pan. Waterproof socket and insulating disk are screwed to base. Wires pass through rubber-grommeted hole into supporting pipe. Top of socket should be spaced about 2½″ above pan. Socket sleeve (left) is plastic.



UPPER AND LOWER SECTIONS are held together by a ¼″ bolt or threaded rod. This one is soldered to the supporting arch; a bolt threaded all the way could be fastened with nuts and washers. Holes are drilled in the cover and cap to clear the rod. The bolt and knob must be made of rustproof metal so that lantern can be opened to change bulb.

FIT THE PLASTIC panels to the frame. Mark, drill and tap the holes. Leave the paper mask on while you work.

SPREAD RUBBER PUTTY or similar compound on the edges to strengthen and weatherproof the joints.

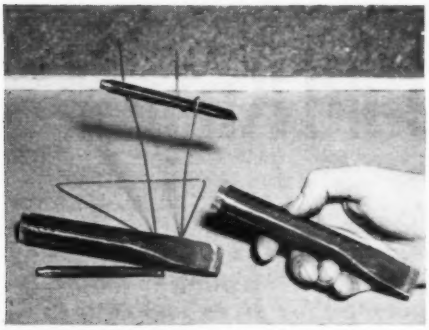
SCREW THE PANELS in place. Paint or lacquer the metal parts before you permanently install the panes.

BADLY BEAT OVER and ready to let go a flying chip at the next few hammer blows, these tools need safe-ending treatment.

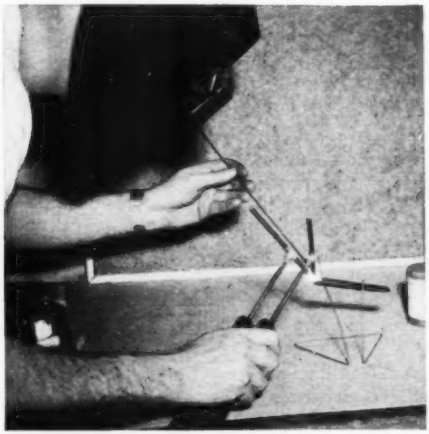
Bronze Collars Make Tools Safer

A bronze ring on your cold chisel may keep a steel chip out of your eye.

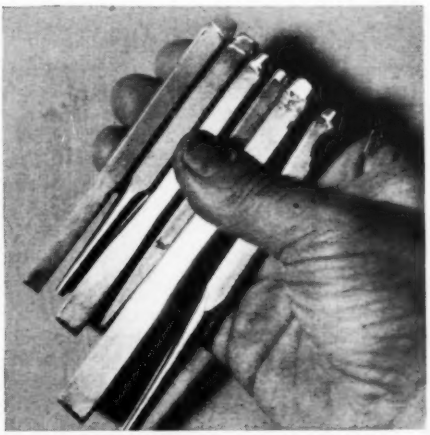
MACHINISTS in many large plants now "safe-end" impact tools such as punches and chisels. They do this by brazing a resilient bronze ring on the end of the tool that the hammer hits. This reduces the danger that blows from the hammer will splinter off spalls and drive them into the worker's flesh or eyes. It's a good idea to improve home tools this way, too.—*E. Wright.*



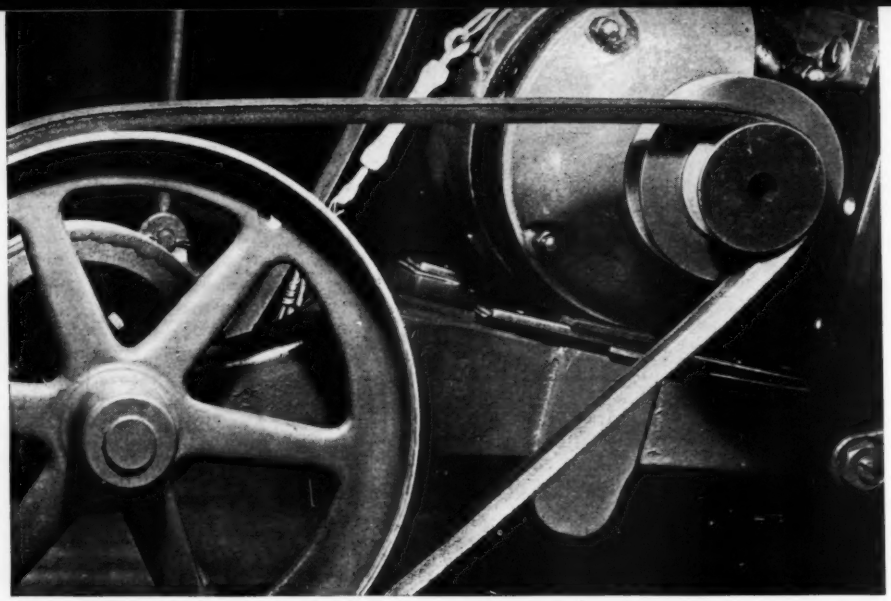
SHOULDERS, in proportion to size, are ground on the heads of the chisels. The wire stand is used to support them while brazing.



A COLLAR is built up by brazing a bead of impact-resisting bronze on the tool shoulders. Flame or electric brazing can be used.



NOW THEY'RE SAFE—a representative group of cold chisels and punches with newly added bronze collars dressed down.



What You Should Know About V Belts

Here's how to replace the sinews of your washing machine and power tools, and how to figure pulley sizes and ratios.

HARDLY a shaft turns nowadays without a V belt around it. Your automobile, power tools, washing machine, refrigerator, power mower and perhaps furnace all have V belts humming inside them. In many applications they've pushed the old flat belt out of the picture. Replacing such a belt is one of the maintenance jobs almost anyone can tackle.

When you're building a powered gadget, a V drive may be your best bet for getting movement from one shaft to another. With special pulleys, it can serve as a clutch or even a variable-speed transmission. V-belt drives don't slip when properly designed, and keep pulling even when wet. Here's why:

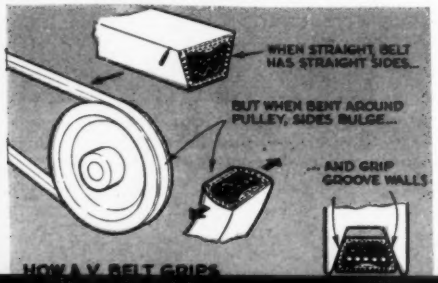
It's in the bulge. The bottom of a V belt doesn't touch the pulley at all. Its grip is all in the sloping sides. Flat when the belt is straight, they try to bulge when it is curved around a pulley (which engineers call a sheave). Since the flanges restrict the bulge, the belt wedges in them and grips.

If a V belt mysteriously slips even though clean and properly taut, examine the pulleys. The flange faces may be worn concave, so that the belt bulge can't fill the groove tightly.

Replacing a belt. Once a V belt is oil-soaked, or shows peeling fabric or ply separation, it's time for a new one.

If you can read the code number on the

"MUSCLES" OF V BELT BULGE when it bends around a pulley. This gives it driving grip. Pulley walls must be straight. If they're worn concave, they lose contact with the bulge.



belt, jot it down to buy the new one. The "L" stands for a light-duty belt, and the number before it is the approximate width in eighths of an inch. Light-duty belts come in 3L, 4L and 5L widths. The next figures are the length in whole inches. The final figure represents any fractional length in decimals. The letters LS mean the belt is not standard in all respects.

Thus 5LS325 designates a nonstandard light-duty V belt nominally ⅝" wide (actually 21/32"), and 32½" long.

What if the belt has no marks, or if they are illegible? The make and model number of the machine may be all you need. Failing that, you can measure the old belt. Let it lie flat and wrap a tape measure around the outside. Since belts always stretch in use, it's more accurate to measure over the pulleys. Slack off any tensioning adjustments three-fourths of the way. Then use a tape as shown in one of the photos.

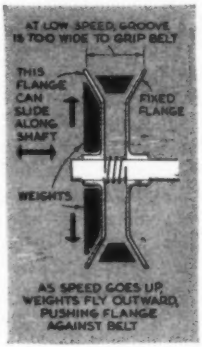
In a twin or multiple drive, where two or more belts run side by side, it's poor economy to install only one new belt. It will carry more than its share of the load, and wear fast. Replace such belts in sets.

Why they wear out. Usually, V belts last so long you're surprised when one finally needs replacement. If buying new ones gets to be a habit, better find out what's wrong. Here are some of the things that shorten belt life:

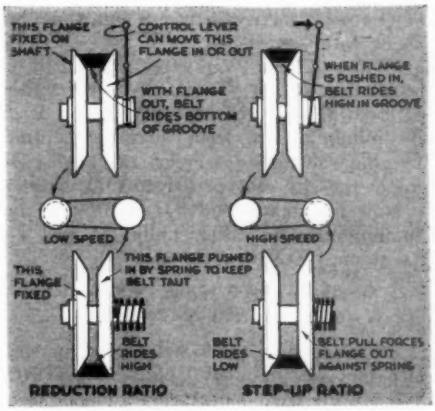
- Looseness. When a machine starts up or is suddenly loaded, the drive side of a loose belt will suddenly snap taut. Such jerks stretch it more than a steady pull, and may even break it. Don't be afraid to pull V belts tight. They should have a live snap to them when thumped with the fingers. Remember to take up a new belt after it has stretched.
- Misalignment. If pulleys are not aligned, the sides of the belt take a lot of punishment. In twin drives, a misaligned shaft will stretch one belt more than the other. Check pulley alignment with a straightedge.
- Rough sheaves. You may as well run a belt over a grinding wheel as on rusty, pitted or worn sheaves.
- Oil and heat. You can buy special V belts to withstand these natural enemies of rubber. Ordinary ones won't. Keep oil and grease off, and beware of belt guards that interfere with ventilation.
- Slipping. A slack or overloaded belt may stand still on a spinning pulley while friction burns the rubber. Don't use belt dressing of any kind. It's poison to V belts.
- Undersize sheaves. There's a minimum pulley diameter for each V-belt width. If you bend a belt over too small a pulley, overheating will destroy the belt.

New ones are slimmer. The narrow V belts common on late-model cars have the middle bulk left out. Their sides meet at the bottom in a sharp edge. Being more flexible, they can run faster and around smaller sheaves than standard V belts. And they heat up less.

Narrow belts cannot be used, however, on ordinary V pulleys. They require special ones. Since these are narrower, too, the

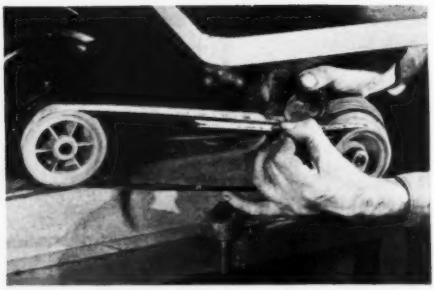


CLUTCH PULLEY. Centrifugal pulleys like this take up the load only at a certain shaft speed, and release below that. One flange, free to slide sideways, is pushed toward the other by centrifugal weights, steel balls or fluid mercury, gripping the belt. Such pulleys let electric motors come up to speed with less starting effort. On gas engines, they make the throttle serve as a clutch.



PULLEYS CAN SHIFT SPEEDS. If flanges of a pulley are deep and one is free to slide along the shaft, it can change the diameter on which the belt rides. To compensate for the resulting change in belt tension you need a spring-loaded idler or, as above, a paired pulley that has a movable flange. This is held against the other by a spring, but is forced away as belt shortens. Variable-ratio drives can have manual or centrifugal control.

OPEN-END V BELTING is used where regular endless belts can't be. These two types of end fasteners are made by B. F. Goodrich.



STRETCH A STEEL TAPE around the pulleys to measure for new belt. Slacken adjustment to allow for take-up after belt stretches.

whole drive can be made more compact.

Planning a V drive. Here the problem is to transmit power from one spot to another, maybe changing speed and torque at the same time. Belt manufacturers publish manuals with which you can plan drives easily. But it's not hard to figure a drive with plain arithmetic.

Start with the speed (r.p.m.) of the driving shaft, the desired speed of the driven one, and the horsepower to be transmitted. An ordinary 3L belt (⅜" wide) can handle 1/5 hp. from a 1,750-r.p.m. power source, or ½ hp. at 4,000 r.p.m. But ¼ hp. at 1,750 r.p.m. calls for a 4L (½" wide) belt; and 1 hp. at that speed requires a 5L belt. If you're not well within these limits, better check with your dealer.

With a 3L belt, your drive pulley can be as small as 1½"; with a 4L, 2½"; and with a 5L belt, 3½". If you have a pulley at least the minimum size, you can do some trial figuring with the formulas on page 231 to get the size of your driven pulley.

Now find belt speed by multiplying the circumference of either pulley in feet by its r.p.m., or use the formula:

.262 times pulley diameter in inches times r.p.m.

Either method gives belt speed in surface feet per minute. Unless sheaves are dynamically balanced, it should not be over 6,000 s.f.m. The most efficient belt speed is below that figure—4,000 s.f.m. for endless, 3,000 or less for open-end belts.

Bigger pulleys, more power. If the belt speed is too high, you'll have to use smaller pulleys (in suitable ratio for the shaft speeds) at a sacrifice of power capacity. As long as belt speed is within safe limits, it is more efficient to use larger pulleys. At 1,750 r.p.m., for instance, a 2¾" drive pulley will transmit only ½ hp., whereas a 4" pulley will carry more than 1 hp. If the bigger pulley needed to carry your load brings belt speed too high, a twin-belt drive may be the answer.

When a small pulley drives a big one, as might be necessary on a power hacksaw, the belt may touch so small an arc on the little sheave that power is lost. Avoid extreme differences in pulley sizes by using a double reduction, with four pulleys and two belts. Use two ratios that multiply to give the over-all ratio wanted. (A 1-to-3 drive to a 1-to-5 reduction gives a total of 1 to 15.)

Turning a corner. When two shafts are at right angles, as in the case of a drill press driven by a horizontal motor, you may be able to use a quarter-turn drive. Because this is an off-alignment drive, center-to-center distance should be six times the big-pulley diameter, and pulley ratios must be low—no more than 2½ to 1. If you want more speed reduction, better get it in a preliminary reduction step.

V belts can run on flat pulleys too. V-flat drives are recommended where ratios are big and center distance short, as in the motor-to-countershaft drive of a bench lathe. Straight-faced rather than crowned flat pulleys should be used, and belt tension should be watched closely.

V belts as clutches. A simple way to engage a drive is to leave a V belt slack and tighten it with an idler pulley controlled by a lever. A grooved pulley working out from the inside of the belt on the slack side of the drive is best.

If you put the idler on the outside, it must overcome the natural curvature of the belt—bend it backwards—before accomplish-

ing its purpose. Placed on the taut side, it tends to pull the belt away from full contact with the drive pulley.

If the idler must go outside the belt, it should be a flat one and at least 1½ times the minimum pulley diameter.

You may find the idler doesn't slack the belt off effectively, and the "clutch" drags. A close-fitting guard around the drive pulley may help. It will force the belt to a curve more closely paralleling that of the sheave, but not in contact with it.

Automatic clutch pulleys. Another way to use a V drive as a clutch is to install a centrifugally controlled pulley that grips the belt only above a certain shaft speed. As the engine is revved up by the throttle, the sheave takes hold. To "throw out the clutch" you simply close the throttle.

By designing a clutch pulley with a very deep groove, you get one that changes pitch diameter. One device of this kind, shown in a drawing on page 229, can be set manually for the desired drive ratio. Another variable-ratio pulley is centrifugally controlled. The faster the shaft speed, the higher the belt rides. This can be used with a spring-loaded driven pulley or a spring-tensioned idler. Such a drive works well on a scooter, for example (see PS, July '51, p. 129). If belt length is chosen so that the belt goes slack near the bottom of the groove, the gadget serves as a clutch, too. END

DON'T DO IT. Forcing a V belt over pulley edges may damage inner cords. Slack off adjustment to put on a new belt. Step drives should have a tension release to facilitate shifting the belt.

Next month: Complete instructions on building your own high-speed electric handsaw.

FIGURING PULLEYS AND SPEEDS

IF YOU KNOW	AND WANT	DO THIS
Diameter and speed of driving pulley, and diameter of driven one . . .	Speed of driven pulley . . .	Multiply speed of driver by its diameter. Divide by diameter of driven pulley.

Example: A 12" driving pulley runs 400 r.p.m. Diameter of driven pulley is 3". Multiply 12 by 400 to obtain 4,800, which divided by 3 gives 1,600 r.p.m. as the driven speed.

IF YOU KNOW	AND WANT	DO THIS
Diameter and speed of driver, and speed of driven pulley . . .	Diameter of driven pulley...	Multiply diameter of driver by its speed. Divide by required driven speed.

Example: An 8" driving pulley runs at 1,200 r.p.m. Driven shaft is to turn at 3,200 r.p.m. Multiply 1,200 by 8 to obtain 9,600. Divide this by 3,200 to get 3" as diameter of driven pulley.

IF YOU KNOW	AND WANT	DO THIS
Diameter and speed of driven pulley, and speed of driving pulley . . .	Diameter of driver . . .	Multiply diameter of driven pulley by its speed. Divide by speed of driving pulley.

Example: A driven pulley 5" in diameter is to turn at 1,440 r.p.m. Driving pulley is on shaft of a 1,800 r.p.m. motor. Multiply 1,440 by 5 to obtain 7,200. Dividing this by 1,800 gives 4" as the diameter required.

IF YOU KNOW	AND WANT	DO THIS
Diameters of driver and driven pulley, and speed of driven pulley . . .	Speed of driving pulley . . .	Multiply diameter of driven pulley by its speed. Divide by diameter of driver.

Example: A gas engine with a 3" output pulley is to drive a machine with a 7" pulley at 1,000 r.p.m. Multiplying 1,000 by 7 gives 7,000, which divided by 3 gives 2,333 r.p.m. as the speed at which the engine must run.

How Did the Arrow Get Through the Glass?

IT'S an old trick, but there is no fakery about it. You can put a solid wooden arrow through any glass or bottle — through holes much smaller than the width of the arrowhead or end.

This particular arrow is pine, but almost any wood will do. It is a single piece of wood, not cut apart and joined in any way. The photo is unretouched; the holes in the glass are actually as small as they look.

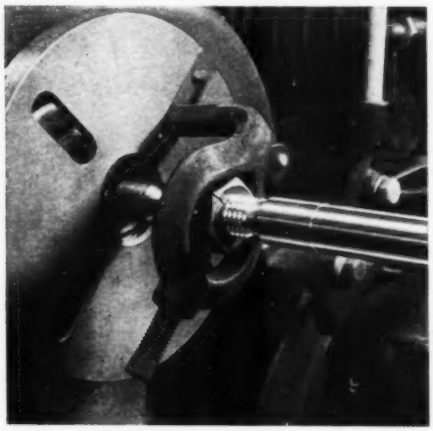
Can you figure out how it is done? See PS next month for photos of the solution.

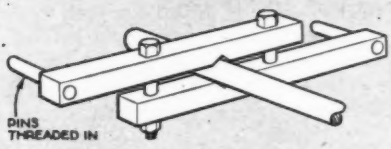
Muzzle Your Lathe Dog

Here's a collection of handy ideas to keep setscrew bite from chewing up the work.

LATHE dogs can be pesky critters. Cinch the setscrew up hard and it cuts into the work; tighten it moderately and it may slip under a heavy cut, scoring the piece or spoiling a threading job. Brass pads to shield the work are troublesome to set up, particularly on repeat jobs. Shafts with accurately ground or threaded ends cannot be touched directly by a lathe dog at all.

A few new tricks you can teach your lathe dogs, together with some special fittings, are shown in the drawings below. They'll make center mounting more useful than ever. The photo illustrates another dodge: using a split nut squeezed tight by the setscrew to grip the threaded end of a shaft.—*C. W. Woodson, Miami.*

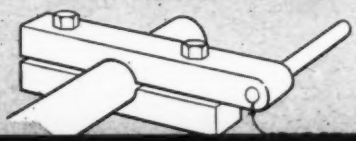




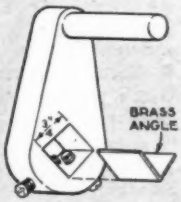
BALANCED DOG (above), eliminates vibration when turning small diameters at high speeds and is also handy for small square stock. Starting from the two V cuts in the center, make both sides of equal size.

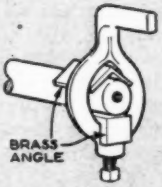
THREADED SHAFTS are held in this de luxe version of the split nut (above). The hole is drilled and tapped to suit and the saw cut is added to permit the lock bolt to spring the split ends together, gripping thread.

CUSTOM-MADE LATHE DOG (below), is brass or cold-rolled steel. Make blank, separate bars with paper, drill and ream to exact size of work. Removal of paper permits tightening on work without marring it.



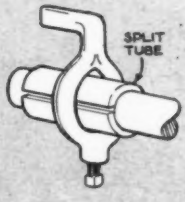
SQUARE STOCK is readily set up in this dog made from 5/8" brass or cold-rolled steel (right). The work can be protected from the two screws by one short length of brass angle, or two shims. It will take stock 3/4" by 3/4".





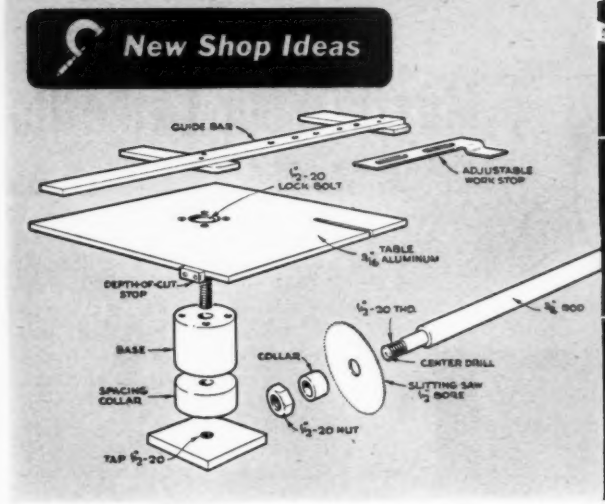
BRASS ANGLE (left), cut to short lengths, does a hurry-up padding job. The pieces are inserted between the work and the lathe dog, forming a protective V block and pad.

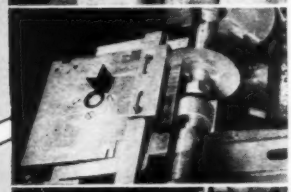
SPLIT TUBE (right), with an inside diameter equal to the outside diameter of the work, takes the bite of the setscrew yet holds the work securely. Save these bushings for future use as you make them up.



BENT ROD (below), brazed to end of work, permits machining entire length. Later, rod can be cut off with a hacksaw and the end of work faced. Light cuts are recommended with this setup.

New Shop Ideas





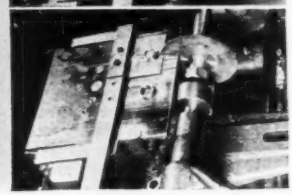
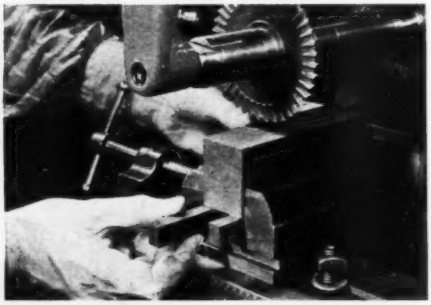


Table for Slitting Saw. This handy rig can be set up quickly on the compound of any workshop lathe, where it will slice metal in the same manner that a circular saw cuts wood. Work is held against the guide bar and fed by hand into a fine-tooth slitting saw that is driven by an arbor held in the headstock chuck. The free end of the arbor is supported by the tailstock center to prevent chatter.

Special fixtures, such as the adjustable work stop (center photo above) used for repeat cuts or uniform cut-offs, can be screwed to the guide bar. A holding fixture is shown in the lower photo guiding a spanner nut up to the saw for notching. A stop block, screwed to the edge of the table, limits the depth of cut. Stop settings are obtained by adjusting the lathe cross slide.

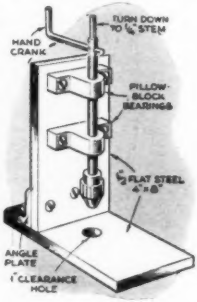
The table, about 6" square, is screwed to the 2"-diameter base, which has been cut to the length needed to bring the table surface even with the lathe centerline. The base, with table attached, is chucked in the lathe and drilled for a ½" bolt. The table top is counterbored at this time to receive the bolt head. A ¾" length of 2"-diameter stock is similarly drilled and used to elevate the table above the arbor for making long cuts. Use a socket wrench to tighten the recessed bolt head.—*Floyd McGuckin, Ridgewood, N. J.*

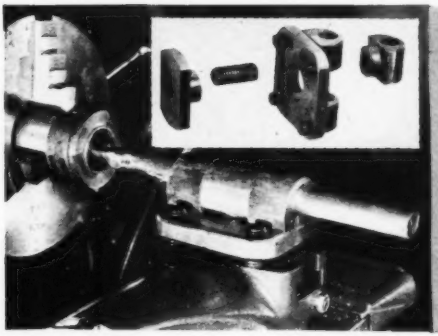
Tool Bits Used as Fixed Parallels. Check your high-speed lathe tool bits with a micrometer. Chances are you'll find those from the same manufacturer are ground to identical dimensions. Two of these will serve as accurate leveling blocks for positioning work in a milling-machine vise or other clamping device.

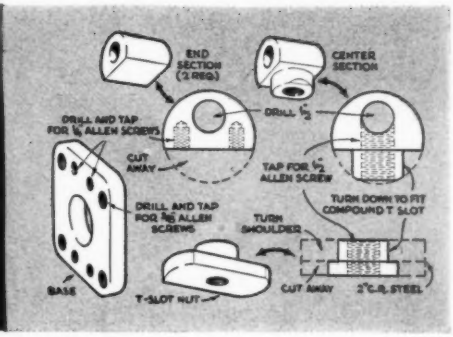


Fixture for Drilling and Tapping. Unless done in the drill press, drilling and tapping holes that are absolutely square with the surface of the work is a ticklish job. This fixture, made up of two slabs of steel joined by an angle plate, will insure accurate work and reduce your percentage of broken taps.

The fixture may be clamped on top of large work. Smaller objects are set on the base directly over the clearance hole. The ½" shaft is threaded for a ¼"-capacity screw-on chuck. An electric drill drives the shaft for drilling, and the hand crank is used for tapping operations.—*J. A. Bell, Philadelphia.*







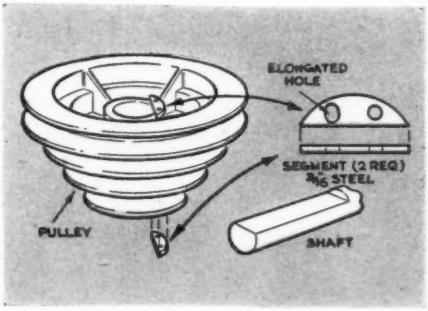
Boring Bar Keeps Alignment. Three clamping sections, machined from 1¼″ cold-rolled steel, grip a ½″ boring bar and reset it to the original position, in relation to the lathe centerline, if the holder must be removed and later replaced. The two end sections are permanently screwed to a base plate about the size of the machined surface of the lathe compound. The boss on the center section fits into a center hole in the base plate.

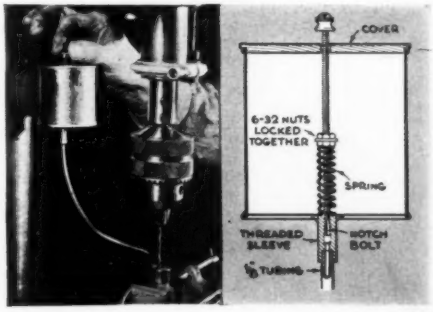
To assemble the unit, slip the boring bar through the three sections, set it to the proper cutting angle and tighten the ½″ Allen screw to lock it in the center section. Screw the T-slot nut onto the free end of the Allen screw and slide the assembly into the lathe-compound T slot. Adjust the four ⅜″ Allen screws in the corners of the base to level the holder and bring the boring bar to the lathe centerline, and tighten them to lock it. To remove, loosen only two of these screws and slide the assembly out of the compound.—*H. L. Luckett, San Antonio.*

Substitute for Splines. The lack of a milling machine to cut splines on shafts of homemade shop equipment or experimental mechanisms needn't stump you. Two segments of 3/16″ flat steel fitted to the bore of a pulley will serve to transn power where either it or the shaft must slide. One of the two holes in each segment is elongated to permit close adjustment against the flat surface of the shaft, reducing lash to a minimum.

The shaft may be rough-filed or hacksawed to an approximate flat and finished accurately with a cup grinding wheel in the drill press. A smoothly ground surface is essential for a smooth sliding action.—*Gilbert Kivenson, Pittsburgh.*

Magnet Holds Cutting-Fluid Tank. This magnet-supported tank can be put where it is needed—and it stays there. A strong permanent magnet grips the tank and, in turn, grips any metal surface that it is placed against. A length of ⅛″ copper tubing carries the oil to the work in a slow trickle regulated by a simple valve. The valve is a long 6-32 bolt with a tapering notch filed in the threads near the end. As the bolt is unscrewed, the oil flows down the notch, flowing in greater quantity as the wider part of the notch emerges from the threaded sleeve soldered to the can bottom. A light compression spring prevents the valve from being turned by vibration of the machine.—*W. E. Burton, Akron.*





CEDAR FENCE MATERIAL varies from one to several inches wide. Fasten it to horizontal two-by-fours with galvanized nails. Rest ends of cedar on ground to take some weight off rails.

FLOWER BED is formed by splits of cedar supported by stakes. Paths through a garden or flower plots along the sides of a house can also be outlined with splits and stakes.

STARTING THE SPLIT. First wedge (left of center) was pounded into natural crack. Other wedge was driven just to right of center to insure more even splitting of the log.

Split Cedar Dresses Up Your Yard

Here's an outdoor building material that grows from Maine to California. In many places it is free for the taking.

"GOLD," the old saying goes, "is where you find it." So is a cedar log.

I found that out one day when I was showing a friend the yard around my brand-new house in the suburbs.

"Of course, this junk will be burned off," I said, waving at the tangle of brush and vines that covered most of the land.

"Better look before you start burning," my friend cautioned me. "There may be cedar logs under that brush."

"An old log may mean something to a

ONLY STORE-BOUGHT MATERIALS in this lakeside bulkhead are 12" spikes. Steps were hewn from logs with hand ax. Siding on boathouse was bought but framing is split cedar.

RISERS FOR GARDEN STEPS are 2" pieces of split cedar 10" wide and 3' long. Flat stones set in concrete provide treads. Risers were nailed to stakes before pouring concrete.

termite or a beaver," I said, "but it leaves me at zero."

"You'll warm up after you see what you can do with cedar logs," he grinned.

He then explained that finding cedar logs on your land is like finding money. We located several of the logs and he showed me what you can do with them. After the logs are split, you can use them for lots of outdoor projects—fences, borders for paths and flower beds, and garden steps.

Preparing cedar logs. After you have located the logs—and cedar is common to a great part of the United States—clear away any vines and rotten wood. Even if the outside of the log is rotten it won't make much difference. An inch or so below the rot you usually find sound wood.

Splitting the logs. For this job, you need a crosscut saw, an ax, a sledge hammer and two or three wedges.

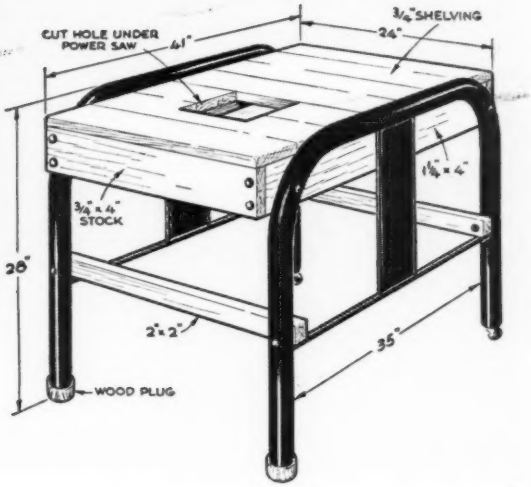
Saw off log ends that may be rotted. Then saw the log into the desired lengths. After a log has lain for some time, cracks will radiate out from the center. Start splitting by driving a wedge into one of these splits in one end of the log.

When the first wedge has been pounded half way in, a crack will open along one side as well as across the face. If the log isn't splitting straight across the face, drive another wedge in line with the first. This usually produces two nearly perfect halves.

When the crack has begun to develop along the side of the log, drive a wedge in the split about a foot from the end. The wedges in the end should now fall free. Continue driving wedges until the log splits in half. In quartering the log, aim the wedges to pass to the side of large knots. Small knots can be sliced with your ax.—*William L. Pollock, Seattle, Wash.*

VERTICAL AND WOVEN CEDAR FENCES contrast pleasingly. Only straight-grained cedar should be used for woven fence. Boards are nailed to posts and woven around vertical pieces.

Bed Ends Make Saw Table



THE two ends of a single bed are the principal parts of this sturdy table. The legs of the head end were hacksawed off to bring the two ends to uniform height, about 28″ with casters in place.

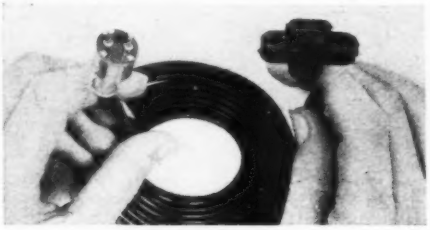
A boxlike table top was constructed by screwing ¾″ boards across a rectangular frame. The top was generously proportioned (24″ by 41″) to provide ample working space. I plan to fit a good-sized drawer below it to store attachments that are used only occasionally. The table top and two lower 2″ by 2″ cross members were attached to the bed ends with 5/16″ carriage bolts and nuts.

The saw was positioned on the table temporarily and an outline drawn for an opening beneath it to permit sawdust to fall to the floor. For a cleaner shop, a removable catch box may be installed.

Although the table can be pushed with ease on its four casters, it does not move when cutting. For safety, however, I plan to replace the two casters at the operating end with wood plugs, or better still, to leave all casters on and add leveling screws. They will take up floor unevenness as well as prevent movement.—*D. L. Miller, Horseheads, N.Y.*

Jumper Cord Aids TV Service

THIS six-foot connector cord joins the two halves of a TV safety interlock. An interlock is used on most sets to disconnect the power cord automatically when the back of the set is removed. The jumper allows a serviceman to restore power easily, without hunting for an outlet. General Electric tube distributors supply the connector to servicemen.



Pail Smothers Blowtorch Fire

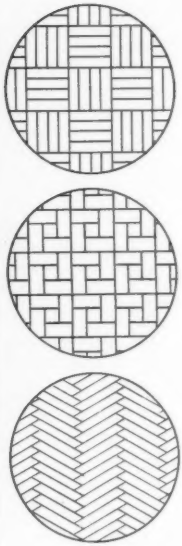
KEEP an empty bucket handy when you are using a blowtorch. If leaking gasoline blazes up, drop the bucket over the torch to smother the fire.

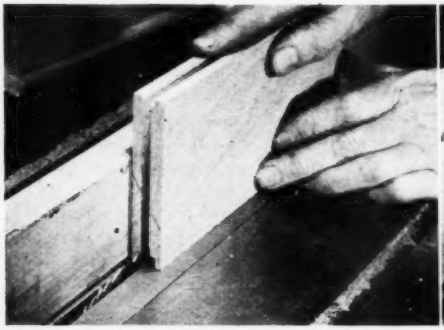
Attachment Ends Tank Sweat

THIS toilet-tank fitting automatically meters in a little warm water from the hot-water supply when the toilet is flushed. This brings the storage tank nearer room temperature and prevents condensation. Dudgeon Distributing Co., Omaha, sells it.

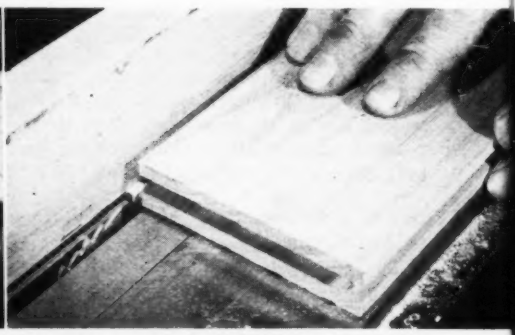
Scrap Lumber Yields Parquet Flooring

With a table saw you can turn odds and ends of hardwood into a handsome parquet floor.

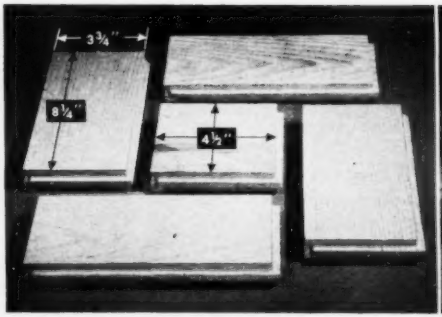




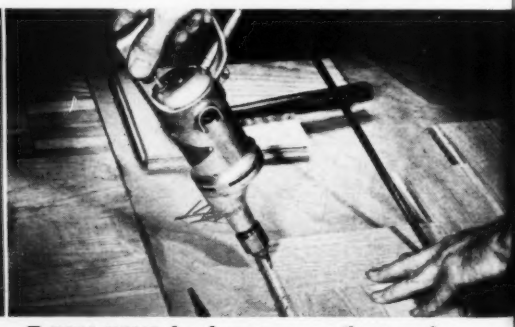
1 RUN BLOCK EDGEWISE over combination blade on circular saw to outline tongue. A ¼" by ¼" tongue is about right for parquet.



2 REMOVE UNWANTED WOOD by pushing blocks through the saw with flat sides down. This leaves the tongue projecting.



4 PATTERN used had four like pieces and one smaller (dimensions do not include tongues). Other layouts need other sizes.



5 DRILL HOLES for four-penny nails at angle through tongues. Paper—preferably building paper—is placed under flooring.

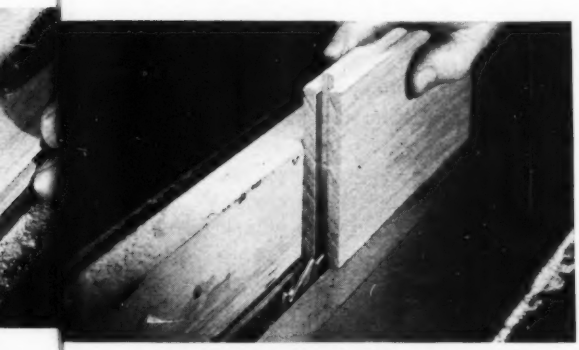
PARQUET floors cost me less than No. 1 common flooring. That may sound like the overstatement of the year, but here's how I worked it out.

I toured the lumberyards in my town and bought—at reduced prices—scraps of hardwood. Most lumber dealers can supply shorts—pieces cut from the ends of long boards and usually sent to the scrap pile.

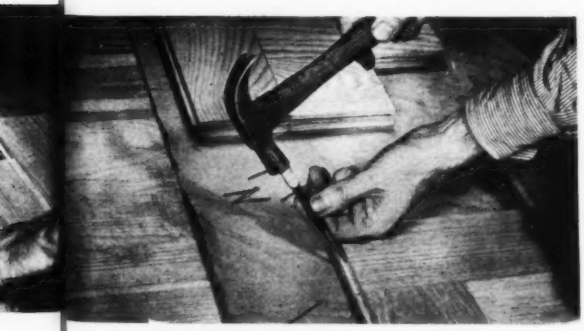
At home, I converted the scraps to parquet-flooring elements on my circular saw. Turning them into flooring consists of squaring the pieces, cutting them to size and forming tongues and grooves on them.

The main requirement when shopping for your scraps is to get them all the same thickness. Otherwise, they'll have to be run through a planer.

The photos show you how to work scraps into parquet units—several designs are illustrated at left. After your floor is laid it should be sanded and given a standard floor finish.—*Walter E. Burton, Akron.*



3 CUT GROOVES with dado cutter on circular saw or by making a series of overlapping cuts with a combination saw blade.



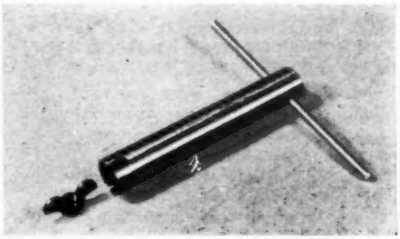
6 DRIVE NAILS part way with hammer and finish with a nail set, setting the heads slightly below the surface of the wood.

Wastebasket Goes Nautical

AN OVAL wastebasket can be dressed up to resemble a ship's stack for use in that nautically decorated playroom.

You can paint the stack navy, gray with a black band around the top, or use a shipping company's letter and colors. Above, a letter is cut out of sheet metal, painted white and screwed to the stack sides with ¼" spacers to set it off.

The finishing touch is a miniature whistle turned from brass. A hardwood turning painted yellow is equally effective. A short length of ⅛" brass rod forms the lever. *Lauren McCready, U. S. Merchant Marine Academy, N. Y.*



Wrench Turns Wing Nuts

WING nuts that are difficult to unthread can easily be turned with a wrench like this. It is a piece of tubing a little larger in diameter than the nut. A slot—filed or hacksawed—takes the wings. The handle is a piece of rod forced through holes in the other end of the tubing.—*Will Thomas, Buffalo.*

Modestly Priced Kodak Hobbyist Enlarger—$44.00. A good enlarger lets you accomplish much more than just make a big picture from a tiny negative. You can select the ideal portion of your picture . . . eliminate unwanted areas . . . make the enlargement even better than the original print. The "Hobbyist" uses "cold light" illumination—perfect protection for negatives. New integrating-sphere lamphouse assures even light distribution. Includes Kodak Enlarging Ektanon Lens, 89mm. f/6.3 (Lumenized), with click stops. For negatives through 2¼ x 3¼ inches.

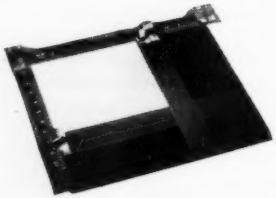
Easy to Set Up. Rapid assembly of the Hobbyist Enlarger gets it into action fast. Disassembles with equal ease for convenient storage where space is limited.

New Negative Carrier. Greatly simplifies loading. Circular in shape, rotates easily. Sizes for 35mm. up through 2¼ x 3¼. One comes with each enlarger. Cups extra.

HOW TO SET UP A DARKROOM

Taking the picture is only half the fun. Developing and printing—and making your own enlargements—can double your rewards in photography. You can set up a darkroom on a modest budget—for as little as the price of a Kodacraft outfit (see facing page). And, for less than $50, you can add a fine enlarger complete with lens. On these two pages you see a wide choice of equipment, all reasonably priced. How much you spend on your darkroom is just a matter of how far you want to pursue this fascinating hobby. Why not see your Kodak dealer about it? His professional advice will help you start off right and keep within your budget.

New Kodak Enlarging Ektanon Lens, 50mm. f/4.5—$14.00. All elements are *Lumenized*. Iris-type diaphragm has click stops down to f/16. There are eight Kodak Ektanon and Ektar Enlarging Lenses for enlargers that take negatives up to 4 x 5 inches. They are all *Lumenized* (hard-coated) and designed for maximum correction at close working distances. Let your Kodak dealer help you select the one best suited for your needs with the Kodak Flurolite Enlarger (see at right).

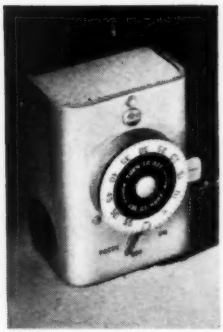


Kodak Masking Easel, 11 x 14—$9.60. For use with any vertical enlarger. Will mask prints up to 11 x 14 inches. Can be adjusted for ¼- to ¾-inch margins. Spring-steel hinges facilitate adjusting print size.

An Advanced Enlarger—The Kodak Flurolite—$99.50 (without lens). Does much more than enlarging. With accessories the 2¼ x 3¼-inch "Flurolite" quickly converts for copying, cine-titling, slide-making, close-up photography, photomicrography, and for use as a view camera. "Cold light" protection for negatives.

Free Your Hands with the Kodak Utility Footswitch —$10.00. Controls enlarger, printer, or safelight. Attaches to floor, or to vertical support for operation by knee pressure. Low-intensity neon light clearly marks its location.

Save Paper and Time—Kodak Projection Print Scale—$1.15. This is a transparency divided into 10 sectors of varying density, each indicating a different printing time. Full instructions guide you in choosing best exposure time.



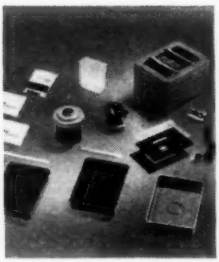
For Precise Timing—Kodak Electric Time Control—$13.50. Plug printer or enlarger right into control for automatic timing from 1 to 57 seconds. Repeat timing possible. Continuous light for accurate focusing is provided for your convenience.

Spring-Wound—Kodak Timer—$6.75. Has both minute and split-second hands. Covers all intervals from ½ second to 60 minutes. Can be stopped and restarted without resetting hands. An added feature is the handy tilting base.

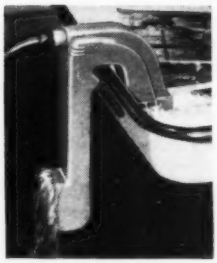
ON A MODEST BUDGET

Inexpensive Printing Materials—Kodacraft Printing Kit—$4.30. Includes three 5 x 7 trays, printing frame, Kodak Velite Paper, graduate, Kodak Tri-Chem Pack, thermometer, stirring rod, book of instructions.

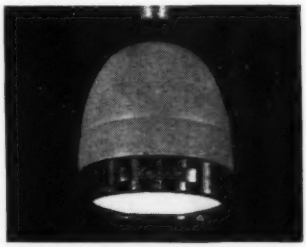
For Developing and Printing—Kodacraft Photo-Lab Outfit—$7.45. Contains new Kodacraft Roll-Film Tank with 620-120, 616-116, and 127 roll-film aprons; Kodacraft Printing Frame; other accessories.



Includes Printer—Kodacraft Advanced Photo-Lab—$12.10. The contents of this photo-lab can all be packed in the metal printer. The printer takes negatives up to 4 x 5½ inches. Includes all other essentials.



Washes Prints Automatically—Kodak Automatic Tray Siphon—$4.50. Washes films, too. Converts ordinary tray into effective washer. Attaches to water tap. Hypo-laden water is continuously siphoned off.



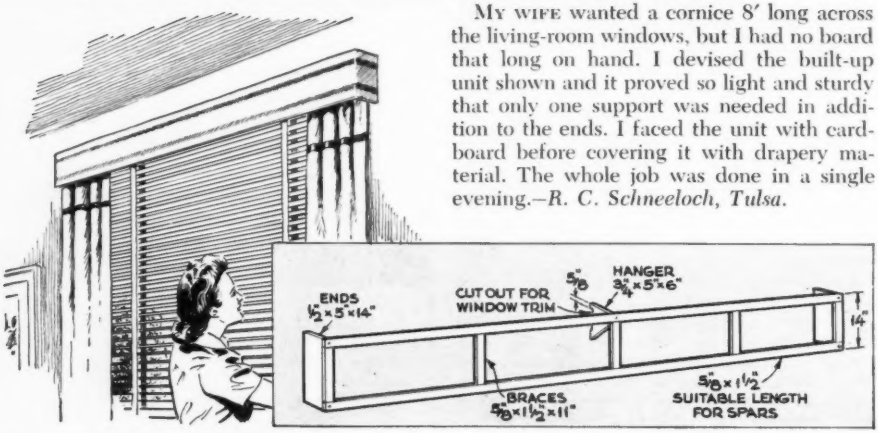
You Need One of These—Kodak Darkroom Lamp—$4.70. Use in wall socket or from a drop cord. Includes a Kodak Safelight Filter and uses 15-watt bulb. Kodak safelight lamps screen out photographically dangerous white light and provide safe working illumination. There's a wide selection available, with prices as low as $1.00 for the Brownie Darkroom Lamp, Model B. The Brownie Darkroom Lamp Kit, complete with Series 0, 2, and 3 safelight cups, only $1.75.

Prices subject to change without notice

Your Kodak dealer will be glad to demonstrate this equipment for you. See him for *all* your photo needs.
EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

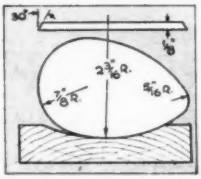
Kodak
TRADE-MARK

Framework Covered with Cardboard Makes Light Cornice



My wife wanted a cornice 8′ long across the living-room windows, but I had no board that long on hand. I devised the built-up unit shown and it proved so light and sturdy that only one support was needed in addition to the ends. I faced the unit with cardboard before covering it with drapery material. The whole job was done in a single evening.—*R. C. Schneeloch, Tulsa.*

Scraper Fits Many Curves

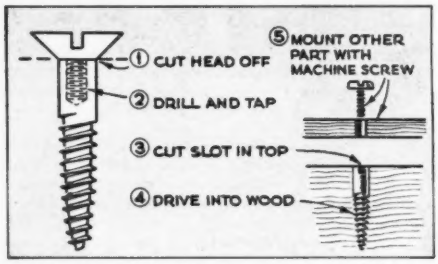


A piece of steel ground to resemble an egg in silhouette is my most valuable scraper. I rotate it on the part to be scraped until a curved section matches that of the work at hand. Work made up of several curves, each having a different radius, is a cinch to scrape with this tool.—*Jesse Lucas, Michigan City, Ind.*

Pencil Picks Up Small Parts

A wax tip on one end of this serviceman's pencil can be used to pick up small parts and start screws in hard-to-reach places. Unlike a magnet, it works equally well on copper, brass, aluminum and nonmetal parts. The stick is one of a series of service tools that are distributed by the manufacturers of Hytron tubes.

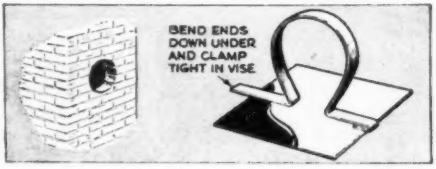
Two-In-One Screw Holds Better



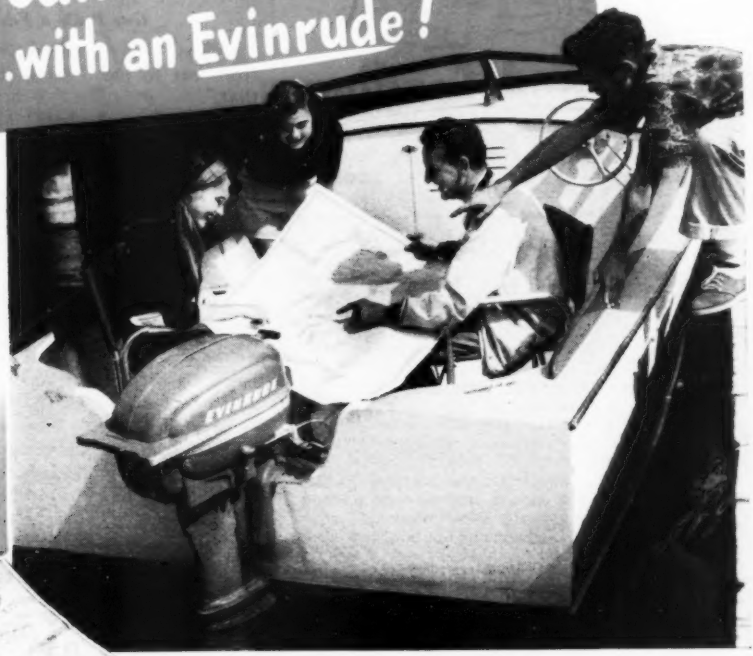
When panels, instrument-case lids or other parts held on by wood screws must be removed frequently, the screw holes usually become enlarged until they no longer hold. I prevent this by adapting wood screws as shown in the drawing. They are screwed in flush with the under part, and the panel or other removable section is held on by machine screws.—*Walter M. Hine, Lynbrook, N.Y.*

Flue Cover Needs No Soldering

I needed a removable chimney-flue cover but found they went out with well buckets in my locality. So I cut a square of sheet metal large enough to cover the flue, looped a strip of metal to a diameter that makes a tight fit when pressed into the flue, bent the two ends of the loop as shown, and clamped the extending ends tightly to opposite edges of the cover.—*R. J. Carabin, San Antonio.*



you can GO PLACES ...with an Evinrude!



Fact is, you can wander all over the chart . . . with speed, comfort, minimum cost . . . in a snug and able cruiser *powered by Big Twin!* Furthermore, you can "trailer" your boat *anywhere,* to waters of your choice. Your cruising horizons are *limitless!*

Big Twin is the motor outboard cruising had been waiting for. A motor with abundant power to reel off the knots on substantial cruising hulls. A motor with *Gearshift* for neutral starting and full maneuverability, and engineered for complete remote control. Above all, a motor with *stamina* for trouble-free performance from shove-off to home-again!

In a single season, on coastal and inland waters everywhere, Big Twin has won its place as the motor for practical, low-cost cruising. If you'd like the whole story, see *your Evinrude dealer!* You'll find his name in your phone book under "Outboard Motors." For free catalog of the complete line of Evinrude models, write EVINRUDE MOTORS, 4766 N. 27th St., Milwaukee 16, Wisconsin.

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Care and Feeding of Engines

BY S. P. CORP

ABOUT AUTOMATIC CHOKES

Whenever an engine stalls during the warm-up period in cold weather, here are the checks to be made with regard to the automatic choke:

1. Automatic choke should allow a very fast idle when first started in cold weather, usually 1000 rpm or more.
2. Use manufacturer's specifications to learn correct idling speed after warm-up, usually about 500 rpm. Carburetor choke linkage is out of adjustment if these speeds are not correct, and will cause trouble.
3. Faulty operation of water thermostat will cause engine to run too cool in cold weather, wasting gas. Dash heat indicator should show 160° while driving, unless a high-opening thermostat is used.

TYPES OF AUTOMATIC CHOKES

One make of carburetor combines a climatic control with the automatic choke. This control is affected by different grades of fuel and can be adjusted for smooth operation during warm-up. Always make adjustment with carburetor on car and engine cold. For average driving, Index (1) should be in center. Loosen clamp and move housing one notch at a time. If engine spits during warm-up, move one notch to RICH, tighten clamp, and check engine.

Where choke is mounted on exhaust manifold, test by removing air cleaner. Choke valve should be wide open. Have someone step on starter and watch valve. It should close and stay closed till engine starts, opening slowly as engine warms up. Remember, engine will run at a fast idle until warmed up.

IF YOUR CAR LOAFS TOO MUCH

No pep on a hill? No pick-up on the level? Get new Sealed Power Piston Rings! If it's a late-model car or truck, get a Sealed Power KromeX Ring Set. The Sealed Power MD-50, best steel oil ring ever made, controls oil even in badly tapered and out-of-round bores. A postal to Sealed Power Corp., Dept. H-3, Muskegon, Mich., will bring you the new illustrated booklet, "More Power, Less Oil, Less Gas!" It can save you real money!

Gus Gets a High-Pressure Job

[*Continued from page 198*]

"Brother, that's all I need. Here, you disconnect that fuel pump. I've got a phone call to make."

Gus Pulls a Fast One

When Gus returned, he was grinning from ear to ear. "Well, that takes care of that."

"Takes care of what?"

"Abigail Thornton," Gus said as he picked up the fuel pump and began examining it. "I just called Jim Staid who runs the hack stand. He's gonna stall her as long as he can by taking his time with that cab. Now if I can only get this car to run."

Gus turned the fuel pump over and over in his hands. "Stan," he said thoughtfully at last, "want to get me another fuel-pump gasket just like this one?"

When Stan came back from the stock room, Gus took both gaskets, put them in place on the pump housing one on top of the other like a sandwich, and began bolting the assembly back onto the side of the crankcase. Then, when he had recoupled the fuel lines, he pushed the starter button. After a dozen or so turns, the engine took hold and settled down to a smooth idle.

"I *think* that's got it," said Gus. "Close the hood, Stan, and I'll test-run her on the road. If she's okay, I can drop her off at Thornton's office in plenty of time for him to meet that train."

"Hey!" shouted Stan as Gus started to back the car out of the shop. "What do I do when the terrible-tempered Mrs. Thornton shows up?"

"That, Stan, is your little problem."

Just a Little Thyrostrat Trouble

Half an hour later, Gus was walking back to the garage. Ned Thornton's car had run perfectly—it hadn't balked at a single traffic light even after it had warmed up—and the real-estate man had been jubilant when Gus turned the car over to him at exactly 11:40.

Stan was sitting in the garage office, feet propped up on the desk, when Gus walked in.

"Mrs. Thornton been here yet?"

"Come and gone," Stan replied smugly, buffing his nails on his shirt front, then inspecting them critically.

"How'd you get rid of her?"

"Well, the poor woman seemed so upset

[*Continued on page 248*]

On Every Oldsmobile for 40 years

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For over forty years—from the days of the famous Olds "Limited" to the flashing 1952 Olds "Rocket," AC Spark Plugs have been standard factory equipment on all Oldsmobile cars.

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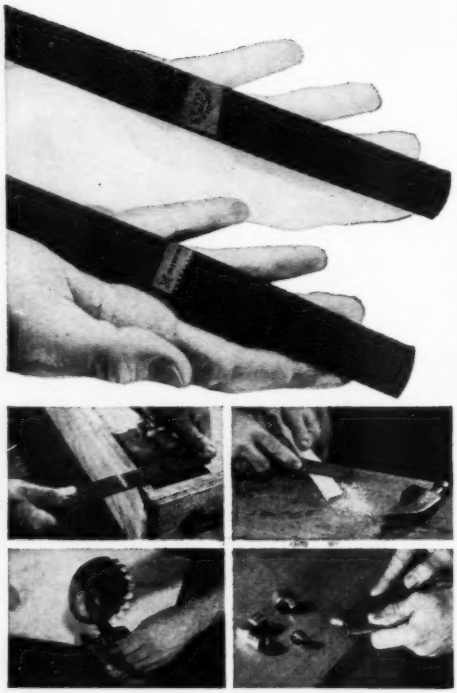
You, too, can enjoy all these *CORALOX* advantages—no matter what make of car you drive—if you insist upon AC Spark Plugs.

AC SPARK PLUG DIVISION GM GENERAL MOTORS CORPORATION



The rasp that outgrew its name

It was originally designed for shoemakers. And it's still *called* a "Shoe" Rasp. But with its four types of cutting surfaces, users have found it "as versatile as a multi-blade jackknife." You can use it on hundreds of jobs—on wood, metal, plastics, leather, etc. On flat, concave, or convex surfaces. It's practically—

FOUR FILES IN *ONE*. . . . One side is half *Flat file*, half *Flat rasp*; other side is half *Round file*, half *Round rasp*. Just the thing for use around the house, farm, garage, workshop, or boat yard!

Ask your hardwareman for the handy Nicholson "Shoe" Rasp. Excellent, long-lasting quality. Also write us for *FREE BOOK, "File Filosophy,"* showing this and many other Nicholson files—plus valuable information on use and care of files.

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BLACK DIAMOND TRADE MARK

NICHOLSON FILES *FOR EVERY PURPOSE*

Gus Gets a High-Pressure Job

[*Continued from page 246*]

about not having the car to drive to that sale down in the city that I told her to take yours."

"You what!" bellowed Gus.

Stan's feet came down off the desk with a slam. "Hold it, boss, don't blow a valve." He grinned. "I was just kidding—your car's still out back where you left it. What I really told her was that the thyrostrat on the automatic sensigear wasn't synchrophased, and that you had to tow the car to the dealer's place to have it duo-timed. That seemed to satisfy her. She stomped off muttering something about how she'd told Ned that car was a lemon and now she had proof."

Gus chuckled. "For once, your double talk paid off."

New Diet Cures Overfed Engine

"Say, what was really wrong with the car?" asked Stan. "You took off so fast I didn't get a chance to find out."

"High fuel pressure," explained Gus. "It was about double what it should've been. On cold starts, that didn't matter too much—the engine could take it—but after it got warmed up the extra gas would choke it out at idling speeds."

"How did an extra gasket on the fuel pump fix that?"

"It moved the pump housing out a bit and shortened the stroke of the pump arm. That cut down the pressure. I've a hunch that when Thornton took the car in for its 500-mile check, the mechanic discovered an oil leak around the flange of the pump and when he replaced the gasket he used one only about half as thick as it should've been. That lengthened the stroke of the pump arm and hiked up the pressure."

Keep Your Fingers Crossed

"Just like I told Mrs. Thornton," said Stan. "It was a simple case of crossed wires to the thyrostrat that caused a loss of power."

"Well, I don't know anything about thyrostrats," grinned Gus, "but how about you applying your power to that grease job out on the rack—and keeping your fingers crossed that Ned Thornton clinches that real-estate deal for the hospital. And you might try crossing your toes, too. Maybe that'll help save Ned's skin when he shows up at home tonight and Abigail finds out he had the car all afternoon." END

Next Month: Gus takes a gamble at long odds.

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UNTIL I DISCOVERED GOLD BOND COLOR TEXTURE!
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Make every job easier...

...USE A SARGENT PARALLEL-ACTION PLIER

The one above, for example, is a PLIER, a CUTTER and a WRENCH with the NON-SLIP JAWS OF A VISE...

And here's what you get:

- **Extreme Gripping Power** developed through compound leverage... parallel jaws hold like the jaws of a vise.
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Builders Hardware and Fine Tools since 1864

Prefabs Can Look Like Other Houses

[*Continued from page 160*]

produce a stressed-skin structure like an airplane wing.

Tests conducted by the Forest Products Laboratory of the U. S. Department of Agriculture have found the wall panels "sufficiently strong and stiff." In the same tests, the roof successfully carried a load equivalent to that imposed by 94 inches of snow and a pressure equivalent to that of a 105-mile-per-hour wind.

Corner Joints Are Critical

If there is a weakness in a prefab, it is at the joints and corners. How expertly the house is assembled, therefore, makes a difference. The panels are toenailed to the base plate, and joined at the corners with vertical two-by-threes, nailed and screwed into each panel. Long lag screws fasten the ceiling joists to the upper plate.

If the house is carelessly put together an occasional crack may develop at a corner or joint. But if honestly assembled, the prefab should be sound.

Incidentally if you have wondered how an electrician wires a prefab with the finished walls already in place, the answer is simple. At the factory, before the panel is closed, holes are drilled in the top and bottom wherever an electric cable is to go and a thin wire is drawn through and tacked to each plate. On the job, the electrician ties one end of the wire to his cable, pulls it through and then makes his connections.

Can't Tell 'Em Apart

Some large cities and some suburbs still ban factory-built houses. But enough communities now permit prefabs to keep the assembly lines going. National Homes' first houses went up in Lafayette in 1940. Unless somebody pointed them out, the average person could not distinguish them from conventional houses now. Many have been immensely improved by their owners.

It would be illusory to expect a housing miracle from prefabs. Not all the economies possible in their construction have yet been passed on to the buyer. But a house-hunter who is willing to accept a standard design, who can mobilize the required down payment and monthly charges, and who isn't afraid to proceed by modest stages can shave the high cost of housing by hiring a factory to build his house and then using his own ingenuity to make it a home. END

Do it WITH Simplicity

REG. U.S. PAT. OFF.

Owners *everywhere* know that EVERY MONTH is a LABOR-SAVING MONTH for a Simplicity with implements. Versatile and reliable, Simplicity makes light work of a multitude of hard jobs (and patented "Quick-Hitch" allows implement changes in less than a minute, *without tools!*) Does so much—it quickly pays for itself in savings of time and work.

THE RIGHT TRACTOR FOR EVERY JOB

3 H.P. Model M-1—5 speeds forward. Fully enclosed gears.

2 H.P. Model L-1—Same features as the M-1 . . . designed for lighter work.

52-week Utility • 28-way Versatility

Discover these benefits for yourself —write for FREE ILLUSTRATED FOLDER and for the name of the Simplicity dealer nearest you or see the classified section of your telephone book.

Simplicity America's NO. 1 Garden Tractor

Simplicity Manufacturing Company
5275 Spring St., Port Washington, Wis.

Coal Locomotive Challenges Diesels

[*Continued from page 154*]

industry and a host of rail fans who mourn the passing of the old iron horse. But its officials deny that sentiment has anything to do with their operation of trains.

First and foremost, the greater part of the road's trackage is built on, around and under the richest coal fields in the southern Appalachians. Even its tunnels uncovered eight-foot veins of bituminous. That offers an immense supply of high-grade, low-cost locomotive fuel. It also provides about 74 percent of revenue traffic.

Steam Likes Long Trains

The conventional steam locomotive, for all of its supposed shortcomings, likes long trains. It also appreciates good coal. Capitalizing upon these facts, N & W long ago began an aggressive campaign to match every claim, real or imagined, of the Diesel manufacturers. It systematically scrapped its older, less efficient engines and replaced all antiquated servicing stations with high-speed, ultra-modern plants.

Today, 90 percent of N & W's freight traffic and 77 percent of its passenger traffic are handled by engines of three standardized, up-to-the-minute designs. All were engineered and built by its own shops.

In the freight field, its giant 12- and 16-drivered "A" and "Y-6" classes rank among the largest locomotives of their type ever constructed. Each can and does handle 175-car trains regularly, where grades and siding lengths permit. Both are so efficient that the road recently tore down 208 miles of trolley wire and scrapped an entire fleet of electric locomotives which were no longer needed to keep tonnage rumbling up the system's toughest mountain trackage. The 12-drivered As handle the manifests (fast freights) at speeds approaching 70 miles an hour, and the 16-drivered Y-6s work the big hills with the heavy coal trains.

On the plush side is the world's most powerful steam passenger engine—the bullet-nosed "J." These big girls sound more like whooshing rockets than locomotives as they lock couplers with 17 streamlined sleepers and coaches and hoist them up the Elkhorn, where the rails climb two vertical

[*Continued on page 254*]

UNCLE WALTER

IT SMELLS GRAND

AROMA PROMISING SWEET RELEASE

IT PACKS RIGHT

CUT TO PACK
SO JOYS INCREASE

IT SMOKES SWEET

MAKES EVERY PIPE
A PIPE OF PEACE!

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE. STAYS LIT TO THE LAST PUFF. AND NEVER LEAVES A SOGGY HEEL IN YOUR PIPE.

It costs no more to get the Best!

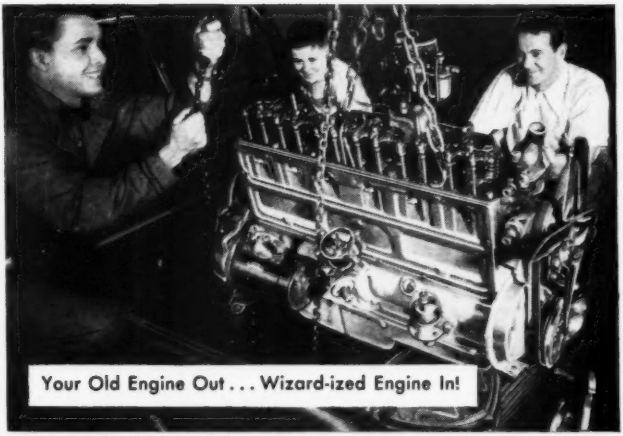
The Biggest Money Saving Idea in Car Maintenance in 20 Years

STOP those endless repairs that keep pulling $10 bills out of your pocket.

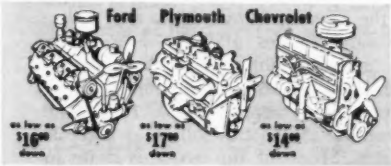
STOP expensive overhauls that still leave things undone to break down later.

STOP paying high gas, oil and maintenance bills on an unsafe, worn-out engine.

New Kind Of Replacement Engines ...Successor To Costly Overhauls!



Enjoy again the new-car thrill of an engine that's packed with surging power . . . power to level any hill . . . power to pull out of tight spots in traffic . . . power that means years of care-free driving and day after day dependability. You can have it now in one complete, guaranteed package in a Wizard-ized Engine. (Attached engine accessories are used from old engine, or may be replaced new.) Yours on easy Western Auto terms!



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New Car Engine Performance for
Chevrolets, Fords, Plymouths, Chryslers, Pontiacs, Mercurys, Dodges, Studebakers, DeSotos, Olds and other popular makes.

No Regular Overhaul At Any Price Can Match Your New Factory Remanufactured*

Wizard-ized® Engine!

HERE, AT LAST, is a new kind of replacement engine for your car! . . . so much **better** than partially rebuilt engines or ordinary overhaul jobs that thousands call it the **successor** to costly overhauls!

"NOT A SO-CALLED "REBUILT" but completely remanufactured in 5 large factories, this Wizard-ized engine gives you an easy, low-cost way to *end* costly repair bills. And you can . . .

GET ANOTHER 50,000 OR MORE MILES from your present car! That's because...

EVERY MOVING PART IS BRAND NEW top quality or fully remanufactured to function like new. Over 150 new parts. That's why you can buy with new car confidence. In fact, Western Auto gives you...

THE SAME GUARANTEE THAT COMES WITH A NEW CAR ENGINE—plus a free 500-mile service inspection of our installation. Still this Wizard-ized Engine is...

PRICED FAR BELOW THE COST OF A NEW ENGINE . . . or about the cost of a bearing, ring and rebore overhaul! Our...

INSTALLATIONS ARE MADE BY trained mechanics in fully equipped garages. So...

SEE YOUR WESTERN AUTO MAN TOMORROW . . . ask about his trade-in allowance for *your* old engine!

Wizard-ized® Engines

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They measure your worth by the tools you own

BUY THE BEST!

Starrett PRECISION MEASURING TOOLS

Good men and good tools go together. That's why skilled workers who own Starrett Tools get the best jobs and the biggest pay checks. When so much depends on it, why buy anything less than the best — Starrett Tools.

No. 230
"Satin Chrome" Micrometer. 1" capacity, tapered frame, Sycamore case.

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No. 711 F
"Last Word" Test Indicator. Reversible action, hard chrome plated contact point.

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Improved Combination Square. With 12" hardened blade, reversible lock bolt.

No. 327
6" Flexible Steel Rule. Graduated two sides; 16ths, 32nds, 64ths.

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Coal Locomotive Challenges Diesels

[*Continued from page 252*]

feet in a single engine-length. As powerful as they are, they can still run smoothly at a top speed of 110 miles an hour out where the track cuts a lonely tangent across tidewater Virginia's Dismal Swamp.

N & W takes pride in the fact that each of its Js averages 485 miles a day, compared to a nationwide Diesel road figure of 461. Road breakdowns, which plague the oil-electric, are practically unheard of. Last year there was one for each 339,500 miles, as against 10,000 miles for one of our largest Diesel users.

Tracking Down Comparative Costs

An amusing angle on the Diesel-versus-steam controversy has to do with a Southern Railway train. For years that system has operated its Diesel-powered Tennessean between Washington, D. C., and Memphis. To shorten rail mileage, the streamliner is turned over to the Norfolk & Western at Monroe, Va., and handled by it—with Js, of course—to Bristol, Va., where the Southern picks it up again. During the 1950 coal strike N & W, of necessity, allowed a Southern Diesel to take over the assignment.

For this the owner road is said to have billed N & W a flat $1.17 a mile, the price of operating the Diesel *at cost*. Yet it is common knowledge within the industry that N & W provides the Tennessean with its Js for 97 cents a mile. At that, the steam wasn't nicked too badly, because the cost of building a J today is about $275,000, while that of a comparable three-unit Diesel is $660,000.

Locomotives Get Streamlined Service

On the servicing side, the N & W dumps 35 tons of coal and 20,000 gallons of water into a locomotive tender, cleans the fire, washes the engine, blows down the boiler, fills the sand domes and the lubricators, does a greasing job, inspects electrical equipment and running gear, makes minor adjustments and repairs, and turns the engine for the return trip—all in as little as 45 minutes. Much of this work is done in fluorescently lighted, tile-walled and glass-brick-glazed servicing sheds, where special ventilating systems carry away the exhaust.

With facilities like these waiting to serve him, the steam-turbine-electric named Jawn Henry should perform even greater feats than his legendary namesake. END

YOU DON'T HAVE TO BE A MECHANIC TO INSTALL YOUR OWN COLORFUL KENTILE FLOOR

anyone can do it in his spare time and save real money!

You can have a floor like this in your kitchen for only $19.75*

Or one like this in your living room for only $36.25*

Write for your FREE copy of the Kentile Color Booklet showing all of the sparkling, modern colors in low-cost Kentile Floors.

ANYONE can install their own Kentile Floor! The tough, durable squares go down one at a time . . . for just a small section or whole rooms at once . . . and colorful Kentile is ready for years of hard wear as soon as it's down. It's quick, easy, fun!

26 wonderful Kentile colors mean that you can create any design you want . . . match any plan. Kentile's ready-to-install decorative inserts make your own floor the only one of its kind.

And, when you've finished, you'll have an attractive floor that will give almost unbelievable service . . . modern colors that can't wear off because they go clear through to the back of each tile . . . simple and inexpensive to clean with just mild soap and water. And the fresh Kentile beauty needs only an occasional no-rub waxing to always look new.

**Price based on a 8' x 9' kitchen and on a 12' x 15' living room*

Your Kentile dealer's low price includes adhesive, instruction booklet and this handy Ken-Kit that contains all of the simple tools needed to do a neat, long-lasting job.

KENTILE.

The Asphalt Tile of Enduring Beauty

KENTILE, INC., 58 2nd AVE., Dept H-6 BROOKLYN 15, N.Y.

Your choice of Block, Strip or Ranch Plank

Just lay *prefinished* Bruce oak flooring right over your old floors...no sanding or finishing

You can give your home new beauty at low cost with a prefinished Bruce Hardwood Floor. Completely finished—even waxed—at the factory, this highest quality oak flooring can be nailed right over old floors. No sanding or finishing . . . no mess or smell. Ready for use as soon as laid. Made in strip or block (parquet) design.

"Scratch Test" Finish — The Bruce factory-applied finish is baked into the pores of the wood. The "Scratch Test" (left) will prove to you that this durable finish does not scratch or chip or mar like an ordinary floor finish.

Moderate in cost — A new Bruce Hardwood Floor will cost you less than a good rug or carpet. Easy to keep clean and beautiful, too. It's just the thing to use in fixing up or adding a room. Let your lumber dealer give you an estimate. Mail coupon below for colorful literature.

MAIL FOR FREE LITERATURE

E. L. Bruce Co., Box 397-B, Memphis 1, Tenn. Send complete information on prefinished Bruce Hardwood Floors.

Name.....

Address.....

City..... State.....

BRUCE **Bruce Hardwood Floors**

Product world's largest hardwood flooring maker

TAKE LESS THAN 1 MINUTE TO

Keep Paint Brushes Like NEW!

Store Them Dry. They Stay Soft and Flexible READY FOR INSTANT USE!

PROCESS 33

INSTANT PAINT BRUSH CLEANER

- Quickly cleans fresh paint from a paint brush or roller.
- You can paint instantly with another color—or store brush dry—it will stay soft.
- Economical—can be used again and again.
- Safe for all brushes and rollers.

Pint 59¢ Quart 98¢ Gallon $3.25

NEW! CHEAP! **OIL BURNER**

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SALESMEN BIG MONEY

SLIPS INTO ANY COAL RANGE, STOVE OR FURNACE

Amazing quick, intense heat. By finger-tip control. Cheaper than coal. No more shoveling coal or ashes. SENT ON TRIAL. Prove it pays for itself quickly by what it saves. $1 bonus for testing. We'll let you try one in your own home for one month. Write for details today. NORTHWEST MFG. CO., 361-C Main, Mitchell, S. Dak.

STOPS LEAKS *PERMANENTLY*

Cut your fixture replacement, water and fuel bills with Economy Renewable Seats. Make economical, permanent repairs quickly and easily with the Junior Kit (illus.). Repair bathroom, kitchen and laundry fixtures. Everything you need included in steel box. This is a natural for the "Fixit" shops—get extra income from making permanent repairs on your customers' faucets.

Senior Master Kit also available—repairs faucets and valves up to 1" pipe.

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JUNIOR KIT, only $22.50

with 15 assorted Renewable Seats

"Less than the cost of a set of kitchen sink fixtures."

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1426 N. Keating Ave., Chicago, Ill.

Which lamp is ready to burn out?

ONE of the General Electric "All-Glass" headlamps on the test car above has just been lighted for the first time. It's at the beginning of its life. The other G-E lamp... the one on the left . . . has been burning day and night for many, many months. Yet when the photo was taken it was impossible to see any difference in the light output of these 2 lamps!

That's because General Electric "All-Glass" headlamps give an average of 99% as much light just before burning out as when new. Both the lens and reflector of the G-E headlamp are made of hard glass, fused together into one piece. Road and laboratory tests prove that this one-piece unit keeps out the dirt and moisture that might otherwise gradually rob the lamp of light output.

Because they DO NOT GROW DIM, G-E "All-Glass" headlamps mean easier, SAFER night driving. Use them to replace burnouts whenever you need a replacement.

G-E "All-Glass" Headlamps DO NOT GROW DIM!

You can put your confidence in—

GENERAL ELECTRIC

Stop RADIATOR TROUBLE Now!

★ Unless you are asking for trouble—your radiator deserves a *thorough* spring cleaning! Get rid of winter's accumulated rust and dirt the easy, effective way—with these three Bowes radiator conditioners. Then you can enjoy care-free spring and summer motoring.

BOWES RADIATOR KLEN-ZUR

Quickly removes rust and scale . . . contains no harmful acid . . . makes cooling system like new.

BOWES RADIATOR RUST-ROUT

Protects the cooling system, prevents accumulation of more rust . . . lubricates water pump, too.

BOWES RADIATOR STOP-LEAK

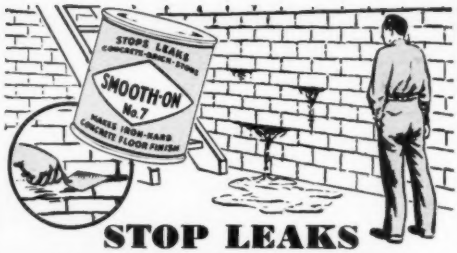
Effectively seals any existing leaks and helps prevent new leaks.

DRIVE IN WHERE YOU SEE THIS EMBLEM

BOWES SEAL FAST

★ It takes so little time to condition your cooling system for spring and summer driving . . . yet it can be so costly and troublesome to neglect it. Don't delay—prepare NOW for spring and summer with Bowes Cooling System Chemicals.

BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, INDIANA



STOP LEAKS IN CELLAR WALLS

Do it with Smooth-On No. 7 Cement! Apply with trowel or stiff brush to leaky cracks, holes, porous spots, seams or other leaks in concrete, brick or stone walls and floors. The leaking will stop and Smooth-On will "stay put", for it expands slightly as it hardens. May be applied to wet or dry surfaces, indoors or outside. Use Smooth-On No. 7, too, to seal openings around pipes passing through walls. Buy Smooth-On No. 7 by name and number in 1-, 5-, 20- or 100-lb. size. If your hardware store hasn't it, write us.

FREE Leaflet and Handbook

We'll send you leaflet showing No. 7 uses, also the famous 40-page Smooth-On Repair Handbook describing other Smooth-On Cements and showing many helpful home repairs. 170 illustrations. Write today.

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Do it with

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NO. 7 CEMENT

NEW 1952 KING MIDGET AUTO

WORLD'S LOWEST PRICED 2 PASSENGER CAR. Drive it for 75c per week. Amazing performance. Surprising comfort. All steel construction. Full accessories, top and heater. Ready to run or assemble it with our bolt together parts. Rider agents wanted, earn your car Free. Send 25c for detailed literature or $1 (refunded first order) for actual assembly book and service manual filled with photos, drawings, specifications, etc.

MIDGET MOTORS MFG. CO.
ATHENS, OHIO

MODERN LAWN MOWER SHARPENER

FOR LAWN MOWER SHOPS
FIX-IT SHOPS
GOLF COURSES • PARKS
101 OTHER JOBS

Sharpens All Reel Type Mowers • Hand, Power or Gang • 10 to 20 Minutes • No Dismantling • No Extra Attachments Needed.

All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist-blades. Handle, wheels, roller and motor remain in place when sharpening is in process. Bed knife is sharpened in same brackets. Grinding head rides on five ball bearing races. Easy to operate. Also sharpens chisels, joiner knives, planer blades. Big profit maker. Own your own business. Send Today for **FREE Illustrated Bulletin No. 11-C1.** Prices Subject to Change Without Notice.

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$263.00 with motor

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Brilliant Italian Race Car Manufacturer

Pays Tribute to Dependable

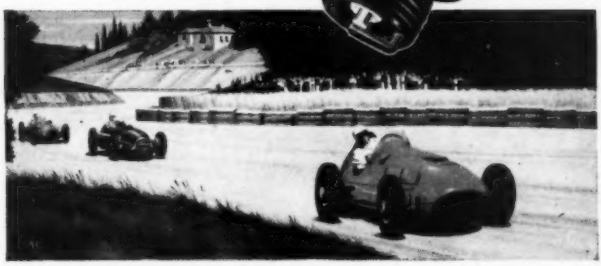
CHAMPION

Spark Plugs

SIGNOR ENZO FERRARI and one of his cars which scored sweeping successes in the Grand Prix of England, Grand Prix of Germany, and the Grand Prix of Italy. Ferrari-built sedans also captured both first and second places in the Mexican Pan-American 1,933 mile road race.

"The victory of Alberto Ascari in one of our Ferrari cars in the 22nd Grand Prix of Italy at 115.547 miles per hour average, established new all-time records for the Monza track, and also established the highest speed attained in European circuits. This 4½ litre 12-cylinder Grand Prix Ferrari was equipped with 24 Champion Spark Plugs which withstood perfectly the uninterrupted strain of instantaneous acceleration and equally instantaneous deceleration demanded by European type of racing tracks. At Monza, as on most European race courses, sharp turns and severe braking alternate with straight stretches where flat out speed is possible. We attribute a great deal of the merit of our success in the Grand Prix of England, Grand Prix of Germany, Grand Prix of Italy and the Mexican Pan-American Race to the magnificent performance and unfailing dependability of Champion Spark Plugs."

ENZO FERRARI



Alberto Ascari in front with the winning Ferrari in the Grand Prix of Italy.

FOLLOW THE EXPERTS

DEMAND DEPENDABLE CHAMPIONS FOR YOUR CAR

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Fill cracks in chairs—

Makes loose joints firm, sands to a smooth finish!

Reset loose hinges—

Replaces rotted wood, tightens loose screws . . . *easy* to apply!

Repairs broken toys—

Mend cracks, nicks! Smooth finish!

Also useful in filling cracks in floors, nail and screw holes, repairing loose tiles. *Handles like putty . . . hardens into wood!*

PLASTIC WOOD®

A CELLULOSE FIBRE FILLER

IN CANS OR TUBES

DOZENS OF OTHER USES

He Invents Paper Boxes
[*Continued from page 167*]

its strange, rather handsome final shape when you twist what appears to be a flat blank for a conventional box. There are fewer interior pieces than in the previous television-tube box, yet those pieces brace the box so well that it can get along with single walls. Its rival needed double walls.

Wives Make the Best Promoters

The saving in material and labor made the Paige box 40 percent cheaper than its competitor. Yet, oddly enough, no box manufacturer in the United States would touch it. Paige says that was because it would have cut their dollar volume too much. At any rate, he and his wife easily

WIFE AND SALES MANAGER, Evelyn K. Paige often finds unexpected outlets for her husband's designs. Box is one she persuaded apple growers to use to frustrate "pinchers."

convinced the British television industry that the box was the greatest "board-saver" available. Now several leading British tube manufacturers are using it.

Paige generously gives his wife credit for removing this and other hurdles from his path. "What every young inventor should know is that the best idea in the world is no good without promotion," he says. "First, you have to discover a real need. Then go to the Patent Office and find out what all the other inventors have already done about that particular need. If you find that you still have something good and new, then get out and push it for all you're worth. Or, better still"—with a wink at Mrs. Paige—"have your wife push it!" END

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in 500 Mile Race

Certified car (Andy Linden's) is one of eight to finish of thirty-three starters . . . comes in fourth . . . with oil consumption of *one quart instead of normal two or three gallons.*

Use Miracle Power

in your gas and oil every thousand miles. Miracle Power contains pure colloidal synthetic graphite—made from petroleum and completely suspended in oil. This synthetic graphite is considered by automotive experts as one of the finest aids to better lubrication.

To Get More Power

from your car, truck or tractor engine, let Miracle Power increase its efficiency. Miracle Power forms a graphoid film on vital parts. This film helps oil maintain a better compression seal. Feel the results . . . increased power . . . smoother, quieter performance and—

With Less Gas

because engine parts move more freely. Minimum loss of power in overcoming friction means more miles per gallon.

And Fewer Repairs

are needed to keep your engine operating at peak efficiency. *In your oil,* Miracle Power protects your engine against rust, acids and DRY STARTING—major cause of engine wear. *In your gas,* Miracle Power provides effective top cylinder lubrication at "red hot" combustion chamber temperatures.

Next time you get gas, get Miracle Power.

THE AP PARTS CORPORATION • *Miracle Power Division* • TOLEDO OHIO
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Attention

FORD OWNERS!

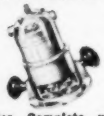
Look for Genuine Miracle Power at your Ford Dealers in this special container.

REVENTS DRY STARTING CAUSE OF ENGINE ULCERS

Save $89.50 on this combination!

PORTER-CABLE Guild

STARTS as a ROUTER



Router Complete with base and motor—$49.50

BECOMES a PLANE

By adding Plane Attachment — $25.00

THEN a SHAPER

By adding Shaper Table — $24.00

Interchangeable Motor powers 3 tools . . . saves cost of 2 motors!

All 3 Tools for only $98.50

For expert woodworking, build your home workshop around this Guild Tool combination – production tools used by Builders – and save $89.50!

As a ROUTER—you can tongue, groove, rabbet, dovetail, do scrollwork, cut contours and beaded edges on wood, composition or plastic.

As a PLANE—you can shave off wood at high speed – taking cuts from 1/64" to 3/32" deep – without a wave or ripple! Attachment for sharpening right on the job.

As a SHAPER—you can edge irregular pieces; joint strips accurately, even narrow and short pieces; make hundreds of fancy cuts for cabinets, furniture, trim, toys, picture framing, molding, etc.

Purchased separately, all tools complete with motors would cost you $188.00. But, with *one* Interchangeable Motor mounted in the proper attachments, you get all 3 tools for only $98.50 – a saving of $89.50!

See this great money-saving combination at your Guild dealer's. Or mail coupon today for full details.

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6183 N. Salina St., Syracuse 8, N. Y.
Send me full information about Guild Router, Plane and Shaper Combination . . . also name of nearest Guild dealer.

Name _____
Address _____ State _____
City _____

Manufacturers of SPEEDMATIC and GUILD Electric Tools
In Canada write: Strongridge, Ltd., London, Ont.

From Broadway to Niagara Falls

[*Continued from page 117*]

tion. The malls, or dividing strips, that separate opposing lanes will be as wide as 120 feet, never less than 20.

At Albany, the Thruway will swing gradually to the west through the Mohawk Valley, the old stamping ground of the Mohawk, Oneida, Onondaga, Cayuga and Seneca Indians. In the early days of our nation, the Mohawk Valley provided the natural artery through which the early settlers moved westward. At first, they poled or sailed their small boats and canoes along the Mohawk River or drove their wagons along the flatlands. Then, in 1825, came the Erie Canal to provide faster transportation for both people and produce. And finally, in 1836, the state's first railroad connecting Utica with Schenectady was built. The route of the Thruway will parallel all three of these early transportation facilities.

Expressway By-Passes Principal Cities

Speeding westward on the expressway, you will skirt New York State's principal cities. You will find every kind of industry represented, from peanut-butter making in Canajoharie to the manufacture of nutcrackers, office furniture, gloves and air rifles in Herkimer.

The land edging the highway produces everything from fruit, wheat, berries and a wide variety of vegetables to grapes for the state's wine industry. You will spot the broad, arching roofs of huge barns and the tall silos that mean good dairy country. If it happens to be late August or early September, you may want to stop off at Syracuse and visit the annual state fair, which was first held back in 1841.

A Good Run for Your Money

Breezing along the Thruway, which never narrows down to less than two broad lanes in each direction, you will pass south of Rochester of Kodak and Bausch & Lomb fame and head for Buffalo. There, where the superhighway forks, you may follow the road north to Niagara Falls or south to the Pennsylvania border, and thus to the end of the Thruway.

That's when you'll reach into your pocket to pay the toll. Present estimates call for a charge of a pénny a mile. When you consider the saving on your brake linings, your nerves and your time—and all that beautiful scenery—it sounds like a fair bargain. END

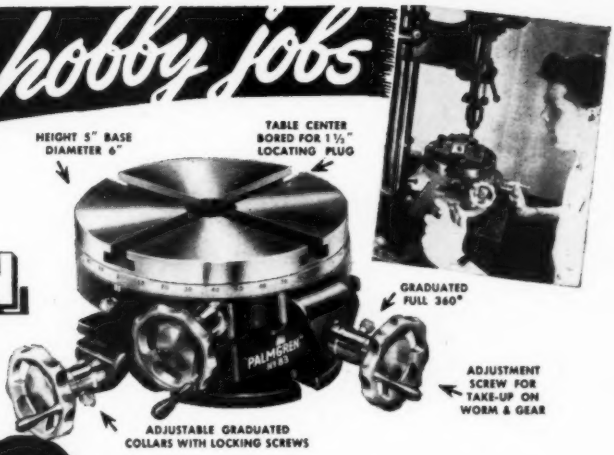
Tough hobby jobs

made easy with

PALMGREN

ROTARY TABLE

NOW ONLY **$54.50**



The Only Table Having ROTARY FEED Combined With DUAL CROSS FEEDS!

It's sensational—in price, in construction, in performance. Makes your drill press a vertical milling machine. You can rout, straight or curved-rabbet-drill-sand or mortise. Also hundreds of other jobs such as milling slots, grooves, keyways, squares, hexagons, curves, flats, dovetails, indexing and laying out work.

Designed for use on Drill Press or Milling Machine, it will handle large tough jobs or small model parts on all types of metal and woodworking projects.

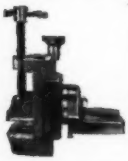
Built by Specialists for LIFETIME SERVICE

Precision built. Permits close tolerances. Rotary feed is calibrated in degrees-cross feeds in thousandths. Cross slides and feeds are 2 1/8" each side of center—4 1/4" overall. Adjustable gibs on cross slides—40 to 1 worm and gear ratio in rotary feed. 4 Bolt slots—2 lock screws.

No.	Base Keyway	T-Slots	Table Dia.	Base Dia.	Ht.	Wt.	Price
83	5/8"	5/8"	8"	6 1/4"	5"	28 lbs.	$54.50
82	As above without ROTARY FEED					26 1/2 lbs.	43.75

OTHER "HOBB-E" TOOLS

"Hobb-E" ANGLE VISES for quick accurate set-ups and any angle. Save hours of time. XI-VISE 1 1/2" Jaws $4.95. No. 000-2 1/2". Jaws Only $8.75



"HOBB-E" MILLING ATTACHMENTS Mill on your lathe. Make T-Slots-Dovetails-Keyways, Etc. Fits any lathe. Graduated for rotary or vertical feeds. Attaches to tool post in 10 Seconds. No. 150-1 1/2" Jaws $20.65. No. 250-2 1/2" Jaws $27.25. No. 400-4 Jaws $43.75

"Hobb-E" BENCH-DRILL PRESS VISES A handy combination. Use on bench for hand work-slide vise off adaptor to use on drill press. Swivel bench Base — 2 1/2" Jaws. V grooved for holding round prices. Only $12.95

"Hobb-E" DRILL PRESS VISES Designed especially for Hobbyists, to make operations on small article more convenient. No. 6—1 1/2" Jaws $3.30. No. 30 — 2 1/2" Jaws $5.50

"Hobb-E" HAND VISE A handy device with unlimited uses in finishing operations. Grips smallest pieces for buffing or grinding without damage and safeguards hands and fingers. No. 15 — 1 1/2" Jaws Wt. 7 oz. Only $2.15

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Enclosed find {Check / M. O.} for $_____ Please send postpaid items marked below:

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NAME_____

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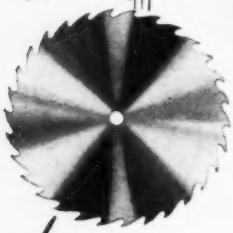
PLEASE WRITE DEALERS NAME IN MARGIN

Home Craftsmen

...these are for You!



ATKINS Mechanic-Kut CIRCULAR SAWS

For fast, smooth cutting without feathering or slivering—for extremely accurate workmanship—this precision saw is a *must* for your shop. 6" to 10" diameters—rip, cut-off or combination. Ask your dealer to let you inspect it!

ATKINS Narrow Band Saws

The *stay-sharp* bands with remarkable resistance to breakage. Tough as tough can be, yet flexible for precision work. In all standard widths. Ask your dealer for Atkins and get the best! Not only the best saw, but the best value!

E. C. ATKINS AND COMPANY
402 S. Illinois Street, Indianapolis 9, Indiana

ATKINS

Use—Don't Abuse—Fine Tools!

ATKINS

How to Sell a House

[*Continued from page 130*]

Mrs. Lucile Midgley Parks of Scarsdale, N. Y., summarized the reasons for adding things: "It's the woman who buys the house, usually. Women today are gadget-minded. More gadgets, more appeal."

Frank O'Hara came up with a list of gadgets that, he thought, improved a house: "A big mirror helps.

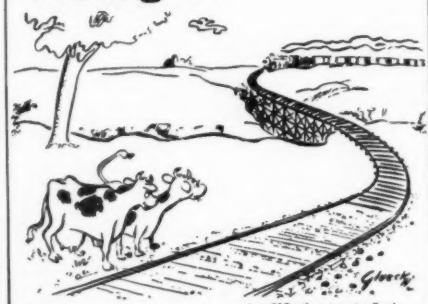
"Picture windows are new and good. A picture window doesn't have to go down to the floor. Matter of fact, it's better if it doesn't—then people can't stare in."

Mr. O'Hara of New York City had a story about gadgets: "A woman came into a house I was selling and spent a long time in the kitchen looking at two tile inserts recessed in the wall for soap and glasses. She never went down to the cellar where she would have seen some of the main things like the furnace and the boiler. She bought the house right on the spot."

Mr. Carlton, on the opposite coast of the U. S., told this one: "An old home was sold for $13,000. Then the owner decided upon an immediate move. How could he avoid a loss if he was to resell? He wood-paneled and papered one bedroom, converting it into a den. He installed electric heaters in the bathroom. He placed bamboo shades across the porch. Total cost: $900. Within six months, he sold for $16,500." END

Next Month: PS tells you how to build a flagstone walk, one of the most attractive and simplest of home improvements.

Timing...



—from C&O railway magazine, Tracks

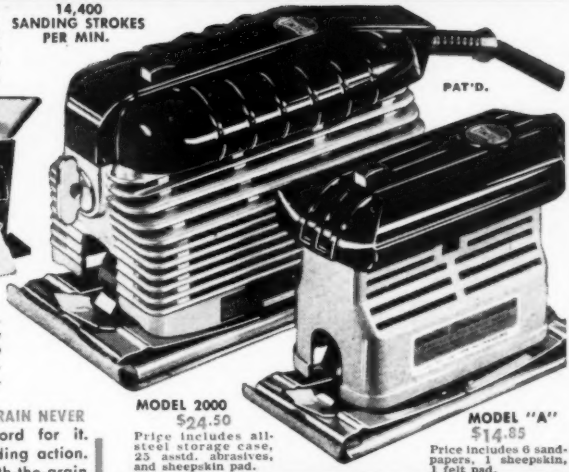
"Not yet—wait 'till it reaches the bridge, then saunter leisurely across."

CHOOSE THE MODEL BEST FOR YOU!

Two DREMEL Electric SANDERS with STRAIGHT LINE Action for Guaranteed SCRATCH-FREE Surfaces

OUTSTANDING PERFORMANCE FEATURES *(In both models)* Only 2 moving parts; 14,400 strokes per min., easy one-hand operation; dustproof—foolproof; 10-second paper change; 110-120 V., 60 cycle A.C. PLUS mirror-smooth, straight-line sanding action.

14,400 SANDING STROKES PER MIN.



Model 2000 FOR HEAVY DUTY CRAFT AND WOODWORKING PROJECTS —Fastest seller in the field for rugged power and smoothest finishes at lowest cost. Ample power for furniture and cabinet making, boat building or refinishing, resurfacing large areas. Great for building operations—woodwork, stairs, dry-wall joints, siding, etc. Does a superb polishing job! Weighs 5 lbs; 21 sq. in. of sanding surface; over-all size 3⅛"x4½"x7".

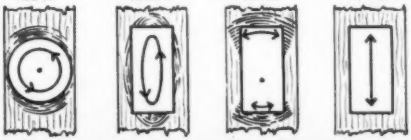
MODEL "A" FOR HOBBIES, REFINISHING, REDECORATING —Finest sander ever offered housewives; home-owners, hobbyists. A lighter-capacity model for woodwork, unfinished furniture, hobby shop projects, etc. Wonderful for polishing waxed surfaces. Also a soothing massager! Weighs only 2½ lbs. Sanding pad 2¼" x 5½".

MODEL 2000 $24.50 Price includes all-steel storage case, 25 asstd. abrasives, and sheepskin pad.

MODEL "A" $14.85 Price includes 6 sandpapers, 1 sheepskin, 1 felt pad.

ONLY STRAIGHT-LINE ACTION SANDS WITH THE GRAIN NEVER MARS OR SCRATCHES—Don't just take our word for it. Ask any professional woodworker about sanding action. He will tell you that only straight-line, with-the-grain sanding can produce a flawless finish.

BEFORE YOU BUY ANY SANDER . . . COMPARE!

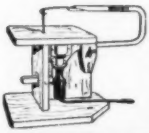


DREMEL Electric COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS

MAKE YOUR OWN JIG SAW PLANS FREE!

JUST GUIDE IT! SAFE! AS A HANDSAW



For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—delivers 7,200 strokes per minute smoothly, effortlessly. Saws through ¾" medium-hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Only 2 moving parts, never needs oiling. Uses 110-120 V., A.C. Free plans, packed with each saw, for six useful woodworking projects and for making your own jig saw.

GRINDS • CARVES • ENGRAVES
DRILLS • ROUTS • SHARPENS

DREMEL Electric MOTO-TOOL

FASTEST MOST POWERFUL TOOL In Its Class—Approx. 27,000 R. P. M.

Most practical tool a man can own—more powerful than any similar tool you can buy. Works well in wood, plastics, and metal. For home maintenance jobs you'll wonder how you got along without it. For model making it's a **must.** And for general shop operations it saves time and money. Compare it, try it, buy it. You be the judge!

CHECK THESE IMPORTANT FEATURES—Oilless sealed bearings • Dynamically balanced armature • Shock-proof, Bakelite housing • Dust-filtered air cooling system • Sturdy 110-120 V., A.C.-D.C. motor • Wt. only 13 oz. • **A precision tool widely used in industry for many years.**

MOTO-TOOL NO. 2 (with 1 emery wheel point) $16.50

MOTO-TOOL KIT NO. 2 With 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers) $23.50

You Be The Judge of Dremel Products—Our reputation has been built on results rather than sensational claims. We invite comparison of Dremel tools with any similar products made. Then you'll know why we guarantee the most for your money!

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DREMEL MFG. CO., Dept. 132-C, Racine, Wis.

How Atom-Snatchers Can Help You

[Continued from page 121]

wondering the same thing. Dr. William Dock of the New York State College of Medicine had tried it on animals and found that it worked. Dr. Steele and his associates—Drs. Leslie Irwin, Eugene Berger and others—performed some of the first thorough tests of the lifesaving powder on human heart patients. They let the patients eat normally salted food, and after each meal gave them a dose of the white plastic powder in a glass of water. For the first time in months they really enjoyed their meals, after which the resins grabbed the sodium before it could enter the system and put it in chemical handcuffs for the rest of the journey through the body.

Patients using the powder steadily lost excess weight, although they enjoyed their meals. When the powder was taken away, they put on pounds; when it was restored, they lost them. The case was proved. Limitations are few. Many patients with serious kidney disease can't take it. Pulling out the alkaline sodium may cause acidosis, but so does a salt-free diet, and it's easily handled.

People who take ACTH and cortisone often gain weight and get moonlike faces from too much water in the system; the salt-removing powder has been used by Dr. T. S. Danowski of the University of Pittsburgh to counteract the effect. Pregnant women sometimes have the same symptoms, and Dr. W. R. Penman of Temple University has used the powder to the great relief of a number of patients.

Resins May Prolong Life

Other especially designed resins are used to remove toxic chemicals from the digestive tract before they can poison the system.

In the Philippine General Hospital, Dr. F. M. Quintos gave a resin preparation to 107 babies with infant diarrhea—a leading cause of infant death in the islands—and reduced the death rate by one-half.

This cleansing ability of resins led Dr. Gustav J. Martin, research director of the National Drug Co., to suspect that a new tool has been found to prolong human life and defer the onset of mental and physical senility. So he took 100 rats, which normally

[Continued on page 268]

Only TAC has perfected the

open-end ratchet wrench...

This TAC Open End Ratchet Wrench is doing spectacular jobs in the Armed Forces and Defense Industries. Made in Socket Type and Crowfoot type. Sizes ⅜" to 4". Will operate with as little as 7° ratcheting arc on fittings, tubing, pipe, rod, cable, etc. Fully protected by patent

TAC does what no other tool can do.

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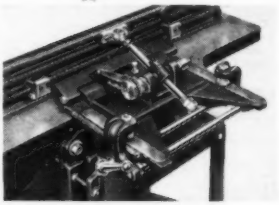
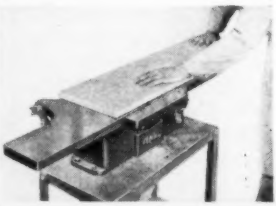
NOW BETTER THAN EVER

Atlas 6" JOINTER-PLANER



NEW FENCE MOUNT

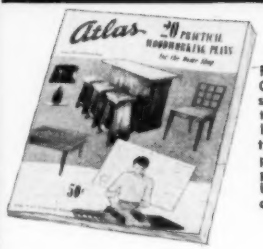
Has 3-point mounting, positive adjustable 45° stops, index plunger for 90°. *Below:* With fence removed, the Atlas gives you over 14" wide support for planing wide boards.



NEW-IMPROVED

A 5-minute comparison and you'll agree: *this is the finest 6" jointer-planer ever developed!* Your yardstick will give you a picture of the work-support size of tables and fence. The Atlas 32" x 4½" fence is longer than the tables of some jointers! And both tables and fence are close tolerance ground to a mirror-smooth finish. *The table surface has guaranteed alignment of .005" over-all* — the accuracy you want and need for the finer joining required in modern furniture construction. The new fence also sets a new high in fine engineering — *absolutely rigid* with its triple supports, *easily positioned* — a pleasure to use. Add the exclusive Atlas features of *simultaneous blade height control, removable cutter head* for sharpening blades without disturbing their setting, *width-of-rabbet scale* — and you see why this jointer-planer is the money-saving pride of any home shop, the money-making tool for builders, cabinet makers, and commercial woodworking plants. Send coupon for complete Atlas woodworking tool catalog.

NEW 20-PLAN BOOK



Finest book of its kind. Original furniture designs by recognized authority. Step by step building suggestions all thoroughly tested. 20 plans only $.50 postpaid. ($.65 outside U. S. A.) Use coupon to order.

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magic pivot DOES IT!

$ for $ and lb. for lb. cuts deeper at 45°

Here's why you haven't seen the best 'till you see the CUMMINS 700

magic • pivot does it! Yes, with this amazing new exclusive CUMMINS feature, the CUMMINS 700 *noses the blade down deeper into the work* at 45° – where other saws lose cutting depth. The CUMMINS 700 actually cuts deeper at 45° with a 6⅜ in. blade than any 7-in. saw and most 7¼-in. saws that cost up to twice as much, weigh 15 to 20 lbs. The CUMMINS 700 weighs 10 lbs.—yet it puts more power at the cutting edge, cuts faster. It cuts full dressed 2-in. lumber at 45° *with blade to spare*—something no 7-in. saw will do.

The CUMMINS 700 with **magic • pivot** is *your king size saw buy!* Price only $69.50—yet it outperforms the field at lower cost, with more power, and a 50% savings in weight to save your muscles.

In addition, Cummins STUB RADIUS blades *last twice as long.* Because they have so much extra blade to spare at 45°, *you get twice as many sharpenings* and still hold full-through-cut at 45°. **magic • pivot** is the first basic improvement in portable electric saws in almost 25 years! Don't buy any saw until you see the **magic • pivot** CUMMINS 700—it is heavy duty, all-ball-bearing industrial quality—*best there is!* See it at your hardware store now.

Let us give you all the facts on this amazing development—send for Cummins Portable Power Saw Pamphlet today.

Cummins

PORTABLE TOOLS

Cummins-Chicago Corp.

4740 N. Ravenswood Ave. Chicago 40

How Atom-Snatchers Can Help You

[Continued from page 266]

live three years, added special resins to the diet of 50 of them and kept the others as controls. The rats which got the resins lived about six years, and post-mortems showed no signs of aging. No one is yet advised to eat resins and live long, but the possibilities fascinate scientists.

In some tomorrow, resins may make it possible to raise food on vast areas of land now arid. In a speech before the American Chemical Society last fall, President James B. Conant of Harvard gazed into his "plastic ball" and foresaw the economical production of fresh water from sea water in 1985. A new ion-exchange device, developed in the laboratory of Dr. Walter Juda, technical director of Ionics, Inc. of Cambridge, Mass., may advance that date.

Tried in Israel

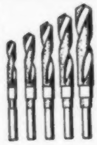
The unwitting godfather of Dr. Juda's invention was Adolf Hitler, who forced him out of Germany when he was 17. After getting his Ph.D. in chemistry in France, he joined his parents in Israel, and worked at a water-demineralization project in the hope of providing sanctuary for more of his people. He was sent to Harvard for further study. Then war came and he helped to devise new mildew-proofing and fire-retarding chemicals for the Armed Forces. After the war he interested investors and set up a pilot plant in Israel which used ion-exchange resins to desalt brackish water. Although this was cheaper than any previous method, the war with the Arabs closed the plant. Use on full-strength sea water ran the cost too high, but now, with "venture capital" advanced by the American Research and Development Corp., Dr. Juda has turned out a far more efficient desalter which may fulfill the dreams of the prophets.

He has invented a membrane with a chemical structure like a saturated fishing net, in which the resins are fixed. As sea water passes over the membrane, a small electric current aids the resins in pulling out the salt. A series of these membranes is enclosed in a tank, and the water, following a mazelike passage, goes in salty and comes out fresh.

If the device proves out commercially, it may not only lift the face of Israel, but irrigate great arid coastal areas of Africa, South America and Australia, ending all fears of world food shortage. END

SURPLUS MACHINE SHOP TOOLS AT PRICES YOU CAN AFFORD

HIGH SPEED DRILLS
¼" to ½" with ¼" Shanks
½" to 1" with ½" Shanks



SET 35Y 6 Different Size H. S. Drills, ¼" to ½" all with ¼" shanks...Ppd. **$2.98**

SET 36Y 10 of above..Ppd. **$4.95**
Set 35Y and 36Y will fit any ¼" drill.

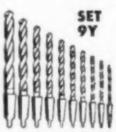
SET 32Y 5 Different Size H. S. Drills, ½" to 1" with ½" shanks ..... Ppd. **$6.95**

SET 33Y 10 Different Size H. S. Drills, ½" to 1" with ½" shanks....Ppd. **$12.95**

These new and used H. S. precision drills with ½" shanks can be used in a ½" electric drill or a ½" capacity lathe or drill press.

SET 7Y 12 Different Size H. S. Straight Shank Drills, ¼" to ½", lengths up to 7" PPD. Only **$3.98**

HIGH SPEED MORSE TAPER SHANK DRILLS



SET 9Y 15 different size High Speed Morse Taper Shank Drills up to 9/16", with No. 1 and 2 tapers. New and used. $50 value. Priced at only **$6.49**

SET 10Y 20 different size High Speed Morse Taper Shank Drills from ¼" to 1". New and used. $70 value. Priced at only.............. **$12.95**

SET 15Y 10 Different Size High Speed Morse Taper Shank Drills from ½" to 1¼". New and used. $50 value. Priced at only.............. **$9.95**

SET 37Y 8 Different Size High Speed Morse Taper Shank Drills from 1" to 2" with No. 3, 4, and 5 tapers. New and used. $125 value. Priced only **$29.95**

H. S. TAPER SHANK CHUCKING REAMERS

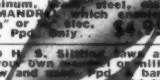
SET 25Y 15 Different Size High Speed Morse Taper Shank Chucking Reamers up to ½" with No. 1 and 2 tapers. New and used. Priced at only **$6.95**

SET 13Y 8 Different Size High Speed Morse Taper Shank Chucking Reamers from ¼" to 1". New and used. Priced at only **$4.95**

SET 12Y 10 Different Size High Speed Morse Taper Shank Chucking Reamers from ½" to 1⅛". New and used. $65.00 value. Priced at only... **$9.95**

SET 23Y 5 different size H. S. Morse Taper Shank Chucking Reamers from 1" to 1¼". New and used. Priced at only.............. **$11.95**

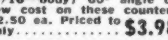
6 Slitting Saws with Mandrel



SET 34Y 6 Different Size High Speed Slitting Saws, 2¾" dia. x 1" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in ¼" or ⅜" elec. drill. $25 Value. Ppd. Only.. **$4.95**

7 selected, sharp H. S. Slitting Saws as above to use on your own mandrel or milling machine. New and used. Ppd. A bargain at $4.95

SEMI-H. S. SAW BLADES: 2¾" x 1/32" x ½" arbor, fine tooth. Fits above mandrel. 6 for...... Ppd. **$1.29**
NOTE: Mandrel only...................30c



NEW HIGH SPEED COMBINATION DRILL AND COUNTERSINKS

SET 2Y 8 selected sizes from A1 to F2 (3/64" drill x ⅛" body to 3/16" drill x 7/16" body) 60° angle of countersink. New cost on these countersinks 75c to $2.50 ea. Priced to you Ppd. at only............. **$3.98**

HIGH SPEED HAND TAPS

SET 1Y 8 different size H. S. Std. Thread Hand Taps up to ⅝", including 2 Std. H. S. Pipe Taps, PPD. **$2.95**

SET 40Y 16 Same as above, PPD. **$4.80**

HIGH SPEED WOODRUFF KEY SEAT CUTTER

SET 4Y 5 different size cutters. Can be used as mounted milling cutter or circular saw. All with ⅜" and ½" shanks, widths up to ¼", dia. up to 1". New and used. PPD. Priced at only.... **$3.95**

Bargain Tool & Shop Mixes!—PPD

SPRING MIX: 300 new springs, compression, tension and torsion types up to 6" in lengths, only....... **$1.79**

HAND REAMER MIX: 8 different size hand reamers up to ⅝" including 3 taper pin reamers. Majority of reamers in new condition........... **$3.69**

MILLING CUTTER MIX: Assortment of 8 various size H. S. milling cutters, all with 1" arbors; up to 3" dia. only **$3.98**

NEW ROTARY FILE MIX: 7 different size H. S. files, ¼" shanks. New cost as high as $2.00 ea. Only...... **$4.49**

DRILL BIT MIX: Over 300 pcs. (3 lbs.) of used H. S. drill bits up to ¼". Most require sharpening. Ideal for pin punches, drift pins, etc. Less than 1c ea. at........ **$2.98**

FILE MIX—BRAND NEW: Set of 12 different files, lengths 6, 8, 10, 12 in. Half rounds, bastards, knife, mills, etc. First line Nichols, Heller and other brands **$3.49**

GRINDING WHEEL MIX: 30 grinding wheels with ¼" arbors, up to 3" in dia., plus mandrel, only..... **$3.29**

DOUBLE-END END MILL MIX: 4 right hand twist H. S. 7/16" straight shank end mills, size 5/16" to 7/16". New and used **$3.95**

SURPRISE MIX!

Over 50 pcs. for your ¼" electric drill including rotary files, drills, bits, reamers, grinding wheels and arbors for our customers who like pleasant surprises. Your money back if you aren't satisfied **$2.98**

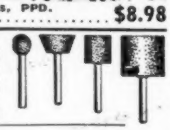
MILLING CUTTERS! MILLING CUTTERS! MILLING CUTTERS!

Just arrived. Several thousand slab mills, side milling cutters, shell mills, shell reamers, etc. Sizes from 1" to 12". Write us for your special needs!

BRAND NEW MOUNTED STONES

100 stones ⅛" and 3/16" shanks, rounds, points, cylinder shapes, etc.
These 100 pieces, PPD. only **$8.98**

NEW MOUNTED STONES



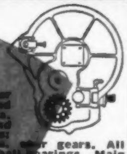
SET 38Y Mixture of 12 Mounted Stones with ¼" shanks. PPD. .. **$2.49**

SET 39Y 24 of above. PPD. **$4.85**

NEW 360° SWIVEL TYPE TOOL HOLDER AND BORING BAR

Here is a tool that will do the work of a left, right and straight tool holder, plus a boring bar, all for a fraction of its original cost.
TOOL A takes a 5/16" sq. bit or 5/16" dia. boring tool. Shank size 9/16" x 1" x 4¾". PPD. Only $3.29
TOOL B takes a ⅜" sq. bit or ⅜" dia. boring tool. Shank Size ⅝" x 1-3/16" x 5¾". PPD. Only..............$3.95
TOOL BIT SPECIAL: 1 doz. H. S. 3/16" sq. x 2½" new tool bits.....PPD. $2.95

THREE-SPEED TRANSMISSION

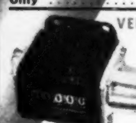


Contains 7 assorted spur and beveled gears, plus auxiliary power take-off driven from main drive. Three separate gear ratios are 16:1, 2:1 and ¾:1. Contains 10½" dia. ring gear, 5", 2½" and 1½" dia. beveled gears: 3¼", 4" and 2¼" dia. spur gears. All mounted on precision ball-bearings. Main drive has screw-in hand clutch. Auxiliary drive can be engaged or disengaged. Excellent for transmission, winch and many other uses. Wt. 30 lbs.................. **$14.98**

90° HEAVY DUTY GEAR BOX: Ball-bearing throughout with ½" drive spline, 1:1 gear ratio which can be changed by different size pulleys or gears. Wt. 5½ lbs. Length 11", beveled gears. Excellent for hot rods, power mowers, etc. Only **$5.95**

40 TO 1 GEAR BOX: Worm gear drive, throwout type clutch, ball-bearing throughout. ½" drive spline, 3¼" output gear. Wt. 6 lbs. Rated up to 6 H. P. Only **$6.95**

VEEDER ROOT COUNTERS



3 Digit clockwise rotation type (New) Ppd. **$1.49**

4 Digit clockwise rotation type (New) Ppd. **$1.89**

5 Digit clockwise rotation type (Reconditioned) Ppd. **$2.89**

5 Digit ratchet type (Reconditioned) PPD. **$2.49**

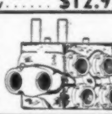
5 Digit ratchet type, with key reset, complete with key, counts in singles. New cost about $17.00 when available. (Reconditioned) Only......PPD. **$3.49**

All counters guaranteed against mechanical defects

PIA PESCO PUMP gear type, displacement 1¼ GPM at 1,500 PSI. Continuous operating speed, 3,750 RPM. Pump is driven by ½" spline. PPD. **$9.49**
Dis. on Quantities

HYDRAULIC CYLINDER

Bore 2", shaft ⅞", stroke 12½", double action, double-end shaft can be mounted stationary allowing cylinder to slide. Wt. 14¾ lbs. Post paid to you at only...... **$12.95**



NEW MASTER HYDRAULIC CONTROL VALVE For controlling two single or double action cylinders separately or simultaneously. Valve is close center type. 1500 PSI rating. PPD. Only **$9.98**

3-WAY CONTROL VALVE:

For use with single action hydraulic rams or cylinders. 800 PSI relief valve. Pointer type handle..................... **$4.98**

HYDRAULIC HOSE

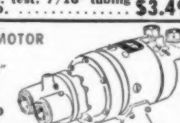
12-in. 250-lb. test with 7/16" tubing conn. 6 pcs. PPD. **$1.49**

2-ft. 1000-lb. test, 7/16" tubing conn. 4 pcs. PPD. **$1.95**

10-ft. 1500-lb. test. ¼" female & ½" male pipe conn. PPD. **$3.49**

15-ft. 1000-lb. test. 7/16" tubing conn. ea. PPD. **$3.49**

PUMP AND MOTOR



Pump has 1" connections, built-in relief valve, adjustable up to 1500 lbs. Max. capacity 6 GPM. 1½ H.P., 24-volt motor, 4000 RPM. Can be used on 12 or 36 volts. 500 units available at quantity discounts. CLOSE OUT AT.. **$9.98**

Money Back Guarantee—All Mdse. Mixture of New and Reconditioned Unless Specified New. All Items (Except Those Specified Post Paid) Will Be Shipped F. O. B. Tulsa—Or, Add 10% and We Will Ship Your Mdse. PPD.

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FREE! SKIL-Chart No. 107 shows how to buy materials and build the above modern furniture. Mail coupon today.

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Plastic Humus Promises Greener Lawns

[Continued from page 109]

The problem was to find a chemical to replace these gums. Some of the gums are natural polyelectrolytes; in water their atoms become electrically charged. So Monsanto's chemists, playing a hunch, narrowed their hunt to a group of water-soluble electrolytes of high molecular weight. And among these they found that substances that become negatively charged—polyanions—worked best. The best of the polyanions—the lab called it CRD-189—became Krilium.

Molecules Grip Soil Particles

Krilium is a polymer, a substance made up of a chain of long molecules. When Krilium is dissolved by water, these long molecules become ionized—negatively charged. Their ends then become firmly locked to the soil particles by an exchange of negatively charged atoms.

This is what keeps Krilium from washing away. Locked to the dirt particles, the Krilium molecules act like bridges between them, keeping them from separating yet at the same time holding them at arm's length so they won't pack down tight.

It will be a while yet before you can buy a bag of Krilium. Monsanto plans to put it on sale late this year or early in 1953. It will probably be mixed with inert substances or fertilizers to make it easier to spread the tiny proportion needed—one two-thousandths of the weight of the soil.

Small Users Find Price Low

Monsanto considers one pound of Krilium equivalent to 200 pounds of peat moss or 500 pounds of commercial compost. At present prices, these amounts would cost $8 to $10. Monsanto expects Krilium to sell, at the outset, for less than $2.00 a pound at retail. Figuring that both peat moss and compost last only a few months while Krilium is known to survive at least three years, the synthetic should have a wide price appeal to home gardeners, nurserymen and truck gardeners.

Farmers, however, may have to wait until mass production brings the price down. The amount of Krilium needed per cubic foot of soil is tiny, but apply this to an acre and it adds up. For some badly compacted soils it could run up to 400 to 500 pounds—$800 to $1,000—an acre.

For erosion control, between half a pound

[Continued on page 272]

SAVE AT GROBAN'S ON THESE BRAND NEW WAR SURPLUS Bargains

GUARANTEED UNCONDITIONALLY

HEAVY DUTY **AIRCRAFT QUALITY**

HYDRAULIC EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc.

Item #29KJ

ITEM #29 KJ—GEAR TYPE HYDRAULIC PUMP. Ideal in Industrial Applications and for operating all hydraulically powered farm implements, including loaders, stackers, swathers, plows, etc. Delivers 1,000 PSI, (may be set at lower PSI if desired), 12 GPM @400 RPM. Maximum operating speed 800 RPM —rotation counter clockwise. Has built-in relief valve, permanent or torque bar mounting, 1" diam. shaft, 3/8" pipe tap inlet, 1/2" pipe tap outlet. Shipping weight 22 lbs. F.O.B. Chicago **45.50**

ITEM #127—Double acting hydraulic cylinder, 1" bore, 4" stroke, 1/2" diam. shaft, 1/4" tubing thread ports. Over-all length closed—6 1/2". Clevis mounting at both ends. Perfect for clamping and feeding. **5.95**

Item #126

Postpaid .....

ITEM #16 C—Double acting hydraulic cylinder, 1 1/2" bore, 26" stroke. Will lift 1750 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $35.00 value. Now Only.

Postpaid **16.95**

ITEM #126—Four-way, open center control valve with built-in adjustable relief valve. Factory set at 1000 PSI., spring loaded neutral position for use with one double-acting cylinder. Fully balanced plunger type, smooth, positive, easy operation, can be used as single unit or mounted in series of any combinations desired. Has 3/8" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8 1/4 lbs. An outstanding buy!

F.O.B. Chicago..... **21.50**

Item #42

ITEM #103—Double acting hydraulic cylinder, 2 1/2" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1 1/4" diam. shaft, 3/8" tubing thread ports. Overall length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago **21.50**

ITEM #6—Double Action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel. 1 1/4" stainless steel shaft. Gov't acq. cost $178.00. Shpg. wt. 26 lbs. F.O.B. Chicago..... **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for.... **32.50**

HYDRAULIC SPEED REDUCER WITH FINGERTIP CONTROL

(Item #115)

USE FOR: ● Reamer Drives ● Midget Cars ● Feed Mills ● Canning Machines ● Conveyors ● Lathes ● Milling Machines ● Motor Boats ● Cream Separators ● Garden Tractors ● Pumps.

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Internal relief valves prevent overloading. Use input power of 1/4 to 1 1/2 H.P.

This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7 1/2"x 7 1/2"x11 1/2". Gov't, acquisition cost, $428.00. Shipping weight 31 lbs. Complete with 2 qts. of oil and full instructions.

F.O.B. Chicago..... **54.50**

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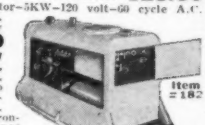
SPECIFICATIONS—Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. ● Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator ● Hobart 115-volt, 60 cycle, 3,000 to 4,000-watt generator. Furnishes either single or three-phase power. 2 or 3 wire. ● Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's Cost Over $1,200.00. SALE PRICE, F.O.B. Chicago..... **465.00**

Item #178

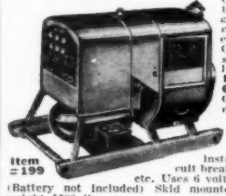
Item #178—350 watt—110-volt—60 cycle A.C. direct coupled to 1 cylinder Midco engine. Shpg. Wt. 116 lbs. F.O.B. Chicago..... **125.00**

Item #182—Onan Generator—5KW—120 volt—60 cycle A.C. single phase, direct coupled to Ford 4 cylinder, water cooled engine with push button start, battery ignition. (Battery not included.) Shpg. Wt. 1200 lbs. F.O.B. Chicago..... **795.00**



Item #182

Item #199—Power Unit PE-99—7.5 KW —120 Volt—Single and 3 Phase—60 Cycle, A.C. Master generator driven by a 4 cylinder, V-type, air cooled Wisconsin engine with magneto ignition, push button start. The self-excited, drip-proof generator is driven from 5 parallel V-belts. Control panel contains engine and generator instruments, including circuit breaker, emergency start-stop buttons, voltmeter, ammeters. Complete semi-enclosed units mounted on steel skid. Weight 1885 lbs. F.O.B. Chicago..... **945.00**



Item #199

Item #201—PE 95-G—10KW—110/220 Volt 60 Cycle A.C. Single Phase. Totally enclosed. Onan generator direct coupled to Willys Jeep, 4 cylinder, water cooled engine, push button start. Instrument panel with engine and generator instruments, circuit breaker, controls, etc. Uses 6 volt car battery. (Battery not included) Skid mounted. Shipping weight 1500 lbs. F.O.B. Chicago..... **1295.00**

Item #180

Item #180—15KW—127/220 volt—60 cycle AC—3 phase—1800 RPM. Brance & Krachy Generator direct coupled to International Harvester 4 cylinder, water cooled engine with magneto ignition—push button start. Panel has voltmeter, ammeter, 4-wire electrical system, belt driven exciter generator, rheostat voltage control. Engine and generator mounted on steel skids. Shipping weight 2600 lbs. (Battery not incl.) F.O.B. Chicago..... **1650.00**

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GENERAL MOTORS—ALLISON

CENTRIFUGAL PUMP

200 GALLONS PER MINUTE

● For Draining Basements ● Fire-Fighting ● Irrigation ● Fuel Transfer ● Swimming Pools ● Home Water Systems ● Dewatering

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This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2 1/2" standard pipe thread, twin outlets with 1 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost $145.00.

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2600
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

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for Stationary or Portable Use. HEAVY DUTY RANGE TO 250 AMPS. NEW 'MAGIC TERMINAL' FOR LOW CURRENT 30 TO 100 AMPS. IDEAL for: ● FARM ● GARAGE ● FACTORY ● WORKSHOP. These precision engineered D.C. Arc Welders contain the highest quality War Surplus aircraft components built to exacting government specifications. They are light in weight, have oversized lifetime grease-sealed ball bearings, air cooled commutator, dial type rheostat for easy pin-point control, a high-low rheostat switch, reactor coil for even arc and the new 'MAGIC TERMINAL' low current welding range for welding lighter materials. Designed for many years of trouble-free service. Run welder from drive pulley or power take off of a tractor or Jeep. 7 1/2 HP electric motor or 10 HP gas engine at 2500 RPM. Uses two V belts or flat belt. Continuous output rating 200 amps. Intermittent welding rating 250 amps, 30 volts. This sensational price includes double V or flat belt pulley and complete operating instructions. Shipping weight 107 lbs. $350 Value. **Item # 65.** F.O.B. Chicago. Now Only..... **119.50**

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Plastic Humus Promises Greener Lawns

[Continued from page 270]

and a pound of Krilium is needed per acre. Even at the starting price, this will make Krilium competitive with straw mulch where straw is expensive or hard to get. Krilium offers other advantages, however. It does not catch fire, is easy to carry and to spread, and you can't see it once it's on. Furthermore, tests so far show no absorption of Krilium by plants; this is being rechecked with radioactive tracers. Anyhow, say the chemists, it probably wouldn't hurt you if you ate some.

Krilium is now being tested by scores of public and private groups under a wide variety of conditions. A race track is trying Krilium to see if it improves running in wet weather. A New Jersey tennis club is trying a close relative of Krilium on some of its courts. And this season Krilium moves up into baseball's big leagues: it will be used on the Pittsburgh Pirates' home grounds.

More Food Is Most Important

But what may be the real news about Krilium is the promise it offers for helping to fill the bellies of a hungry and growing human race. Krilium may make it possible to put to work large areas not now suitable for farming.

Much fertile soil in the western United States, for example, is unusable because it is crusted with alkaline salts. Ordinarily, water would seep down through the soil and carry the salts away with it. However, the land has such poor structure and the climate is so dry that the water stands on the surface and evaporates, leaving the minerals. Monsanto predicts that Krilium can change the soil structure so that the water drains away gradually and takes the salts with it.

The vast unused land areas of the tropical rain forests—jungles—seem to offer another opportunity. When the forest is cut, bacteria eat away the natural humus in a few weeks, and drenching tropical rainstorms start washing away the topsoil. Fields cleared from the jungle often have to be abandoned in a year or two. Since Krilium is apparently neither eaten by bacteria nor washed out of the soil, it may be able to form a stable topsoil for crops. Synthetic humus may prove a milestone in man's struggle to survive. END

Next Month: Easy-to-build storage units for the back yard solve the problem of what to do with ever-increasing home equipment.

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Army type M4A1. Sensational for indirect sighting . . . duck hunting, all sports . . . keeps you dry when boating . . . hobbyists, it's worth its weight in optical parts alone. Made by Minneapolis Honeywell Adapted to many other uses Finest quality prisms wt. 7 lbs., 61½" x 5 x 11½". Approx. gov't. cost $100. Only **$8.95** ea

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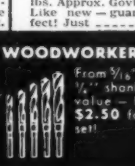
Type Z–2" x 1". Used open or closed. For automatic contacting . . . light, sound, model train systems, chimes, etc NEW! 5 for **$2.** Aluminum Spring Actuator to fit above Microswitch----------5 for **$2.**

THOR PNEUMATIC SQUEEZE RIVETER

"C" Yoke Head. Size PRS-1 Model 4520. Shpg. Wt. 20 lbs. Approx. Govt. Cost $250 Like new—guaranteed perfect! Just --------**$35.00.**

HIGH SPEED DRILLS

All new. Fractional & numbered Orig value $18 Nationally known brand. Assorted sizes Set of 30, **$3.50**



WOODWORKERS DRILLS

From 5/16" to 1½" with ¼" shanks. A $12.50 value — NEW — just **$2.50** for complete set!

HIGH SPEED STRAIGHT SHANK DRILLS

10 different size H.S. Straight Shank Jobber' Length Drills. ½" to ½". (shank same diameter as drill) $25 value. NEW—**$3.50.**

HIGH SPEED DRILLS

SET from ½" to 33/64". 5 sizes with ¼" Shanks—NEW—get this, **$3.00** takes this set!

PRISMATIC HUNTING SCOPE

Compact, rugged, 2 power . . . with calibrated and illuminated reticule. Fully coated optics. Field 50' at 100 yards Eye relief 3½" to 5½". Size 1¼" dia. x 5¼" long. No mounts. Can be attached to commercial mounts having external adjustments or mount rigidly and use internal calibrated retecule May be used as offset sight for bull pups. Shpg. Wt. 2 lbs Approx. Govt. Cost $150 Airborne has 'em NEW for just----------**$12.50** ea

FIRE EXTINGUISHER. For safety's sake order now! Every home, garage, car, workshop should have this handy fire fighting wonder It's fully charged (at 1,000 lbs. P.S.I. or more) with that miracle CO_2 (carbon dioxide) chemical that smothers oil, gasoline & electrical fires. Anyone can operate, in a hurry. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILL costs very little Hose included for emergency tire inflator or air blast. Wt 4 lbs Approx. Govt. Cost $25. NEW, complete with cloth carrying case, just----------**$6.50.**

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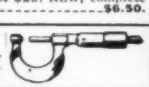

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Finest aircraft quality . . . heavy duty . . lifetime grease-sealed ball bearings. Terrific for truck and marine use, for welders, plating, D C Appliances, lights, etc. Type P-1 Mfd. by Ford, General Electric, Westinghouse & Delco-Remy. Rated 200 Amps., 28 Volts, 2500 RPM., can be "revved" up to 300 Amps Shpg Wt. 53 lbs Approx. Govt. Cost $350 . . New to you----------**$21 50**

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Made for U S Ordnance Dept to rigid specifications Portable steel hand carrying unit is a self-contained trouble shooting device for making a complete and rapid check of the generator battery circuit, including any circuit and voltage regulators Battery voltage, regulators, cut-out settings and generator performance can be easily determined A terrific testing unit for garages, mechanics, truck fleet owners, boat and marine mechanics Can be used on any 6 or 12 volt system Govt cost approx $175 NEW—complete with instruction book—only **$32.50.** Shipping weight, 20 lbs.

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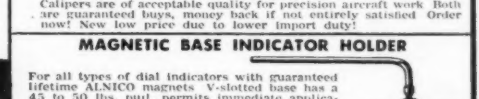

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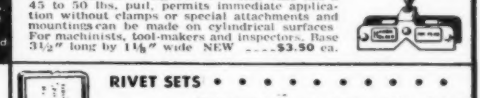

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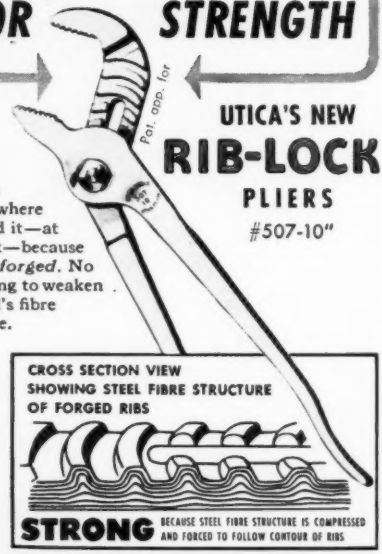

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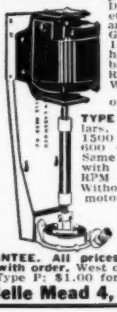

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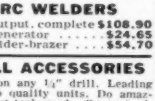

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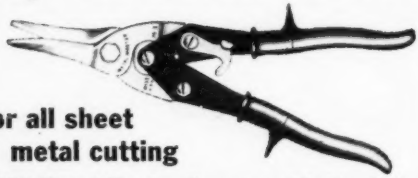

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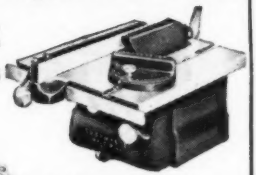

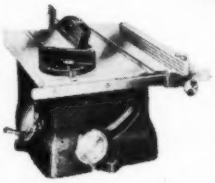

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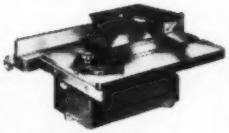

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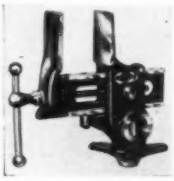

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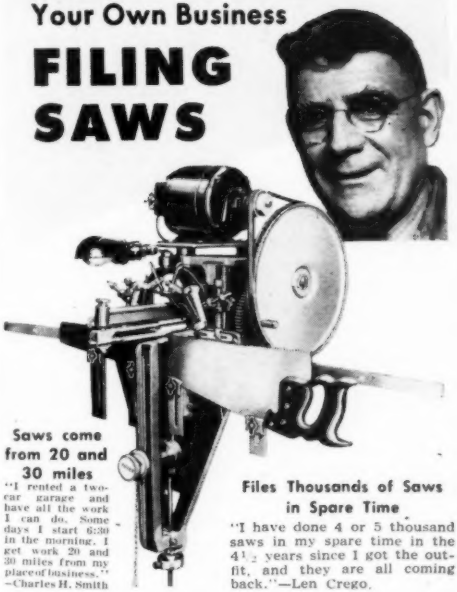
Tells How to Start Your Own Business

FILING SAWS



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Files Thousands of Saws in Spare Time
"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back."—Len Crego.

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Here is a steady repeat CASH business you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

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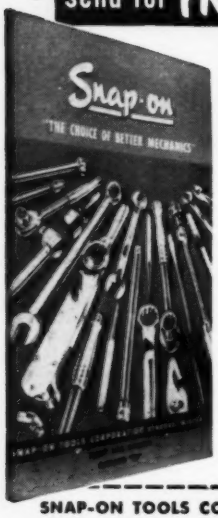

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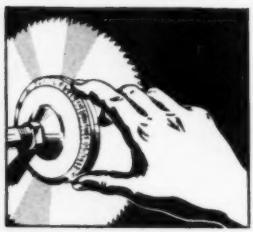

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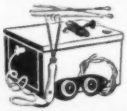

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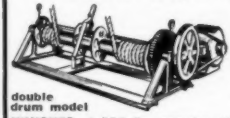

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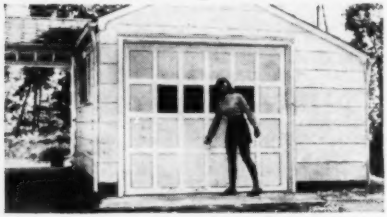

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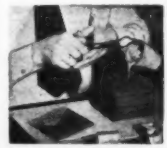

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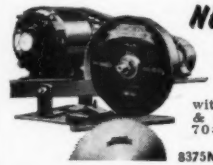

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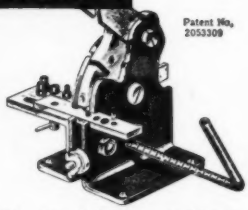

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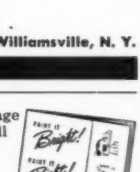

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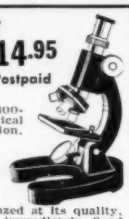

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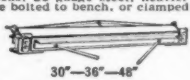

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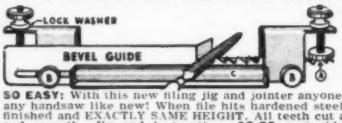

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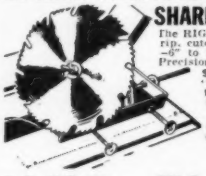

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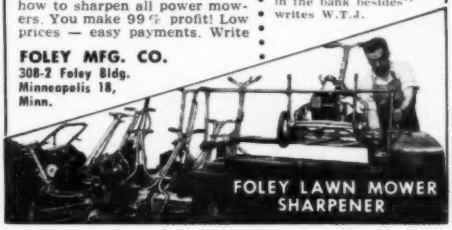

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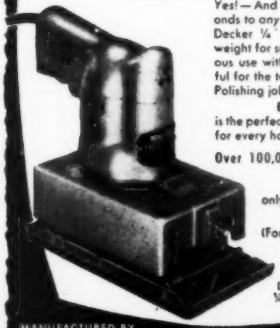

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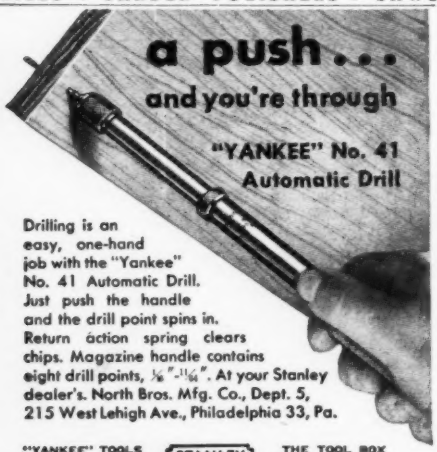

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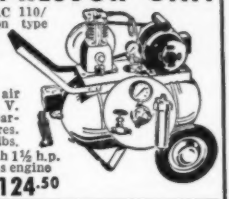

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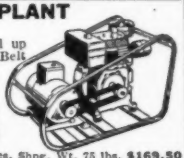

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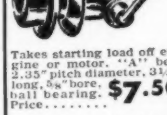
Outfit Less Motor.... **$52.00** — Spray Gun and 20 Ft. Hose..... **$12.95** — Complete Outfit..... **$67.50**

WELLWORTH V-Belt CLUTCH



Takes starting load off engine or motor. "A" belt 2.35" pitch diameter, 3¼" long, ⅝" bore, ball bearing. Price..... **$7.50**

Bushing for ½" shaft 15c
Same clutch with ¾" bore Ideal for lawn mowers, garden tractors, etc. **$8.50**

RED SEAL CONTINENTAL GAS ENGINE

BRAND NEW. 1½ HP with 6 to 1 reduction gear. Operates at 450 R.P.M. For lawn mowers, scooters, garden tractors, pumps, compressors, generators, etc. List Price $79.50. Shipping weight 54 lbs.

SPECIAL PRICE..... **$47.50**

"Wellworth" BLOWER BARGAIN

Quiet operating. Double wheel inlet; double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13⅛"x11⅜"; inlet 8¾". Height 19". Width 18". Depth 16½". C.F.M., ¼" S.P. 1600; outlet vel. 1575. Wt. 45 lbs.

BLOWER LESS MOTOR AND DRIVE **$27.50**

With belt and variable speed pulleys, $2.50 extra. Same blower, complete with ¼ h.p. motor, $47.50.

MOTOR SPECIALS

1/12 h.p., Delco 110V, 60-cy. A.C. 1 phase 1750 r.p.m. 2 amps., will take 50% overload. Shaft ⅜x1¼. Heavy duty, bronze sleeve bearing. Size 6" long, 5" high, net wt. 12 lbs. List $21.00. Special..... **$13.50**

1/10 h.p. ½" shaft..... **$14.50** — ¼ h.p. 32 volt..... **$29.50**

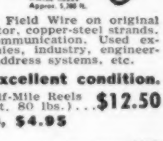
LELAND GENERATORS

2500 to 3000 watts, 110 v. 60 cy. single phase 1800 r.p.m., self excited. Fungus treated for long life. 1951 model. Brand new, in original factory crate. Shipp. wt. 135 lbs. List $375. SPECIAL PRICE..... **$225**

PRICES F.O.B. CHICAGO. MONEY BACK GUARANTEE. SEND CHECK OR MONEY ORDER TODAY. PROMPT SHIPMENT. **WRITE FOR OUR NEW CATALOG. SEND 10c FOR POSTAGE.**

WELLWORTH TRADING CO., 1832 WABASH AVE., DEPT. B-352, CHICAGO 16, ILL.

Communication Problems Solved! with ARMY FIELD TELEPHONES & WIRE



Construction men, engineers, farmers, and industrial men **everywhere** are using portable Army Field Telephones for quick, dependable 2-way to 8-way communication. These phones were built to serve combat forces reliably under battlefield conditions. Simple to install. Just string this 2-conductor wire, attach phones, ring and talk **any distance** up to 17 miles! Powered by flashlight batteries. No maintenance required.

EE8 FIELD TELEPHONES
Factory reconditioned, LIKE NEW: per pr. **$38.50**
(Special: per pr. **$36.50** if you buy wire)
GUARANTEED

ACT NOW! LIMITED SUPPLY!

All prices FOB Sacramento. No COD. (Calif. residents add 3% for sales tax.)
Write for FREE FOLDER. Send check or money order

TELEPHONE WIRE

ALL-PURPOSE — ALL-WEATHER

This is genuine W110B Army Field Wire on original steel reels. Insulated, 2-conductor, copper-steel strands. Excellent for all types of communication. Used extensively by telephone companies, industry, engineering projects, ranches, public address systems, etc.

GRADE 1 — Unused, excellent condition.

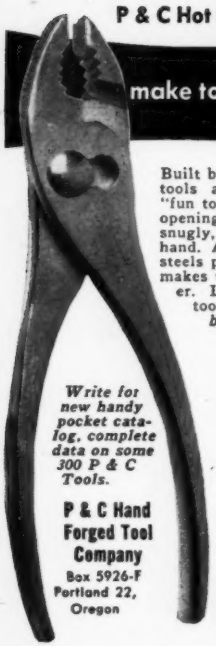
Mile Reels (wt. 160 lbs.) . . **$22.50** Half-Mile Reels (wt. 80 lbs.) . . . **$12.50**

500 ft. reels, $4.95

LORIS SALES, P. O. Box 1896-A3, Sacramento, California

P & C Hot Forged Tools

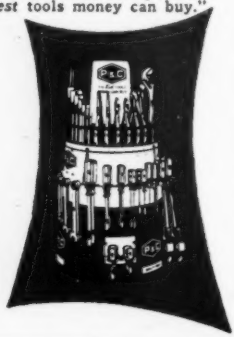
make tough jobs EASY!



Built by master craftsmen, P & C tools are "muscle saving" and "fun to use." They get into small openings, fit nuts and screws snugly, balance perfectly in the hand. And special analysis alloy steels plus scientific heat treating makes them stay on the job longer. Look for the P & C rotary tool display unit and get "the *best* tools money can buy."

Write for new handy pocket catalog, complete data on some 300 P & C Tools.

P & C Hand Forged Tool Company
Box 5926-F
Portland 22, Oregon



REMOVE PAINT *this EASY way!*

Try America's favorite remover! Really saves work. All you do is apply Wonder-Paste with a paint brush over paint, enamel or varnish. Old finish soon becomes a soft mass, easily peeled off with a putty knife. No hard scraping or sanding! Surface is left completely smooth and clean. Harmless to wood, metal, fabric or your hands. Over 3,000,000 cans sold—it must be good!

WONDER-PASTE

Write for leaflet on removing. *At paint and hardware stores*

Wilson-Imperial Company, 121 Chestnut Street, Newark 5, N. J.

ALNICO MAGNETS LIFT 225-lb.

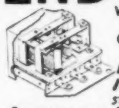
AMAZING PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC. Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from floor sweepings. Clear alley of harmful tacks, nails. Many other uses listed. Pays for itself quickly. GUARANTEED: Try any magnet one week. Money refunded if you are not well-pleased.

No. S-725 (Weighs 54 Oz.) Has a pull of 225 lbs. on a steel block..**$15.00**
No. S-675 (Weighs 49 Oz.) Has a pull of 175 lbs. on a steel block..**$10.50**
No. S-650 (Weighs 41 Oz.) Has a pull of 150 lbs. on a steel block..**$ 8.50**
No. S-550 (Weighs 14 Oz.) Has a pull of 50 lbs. on a steel block..**$ 4.00**
No. S-530 (Weighs 8 Oz.) Has a pull of 30 lbs. on a steel block..**$ 3.00**
No. S- 30 Hobbyist assortment of six small magnets.....**$ 1.50**

Send Money Order or Check. We pay postage. No C.O.D. Shipments.
MIAMI MAGNET CO., 3240 N. W. 27th Ave., MIAMI 42, FLA.

END GENERATOR REGULATOR BATTERY TROUBLE

REPLACE VOLTAGE REGULATOR WITH AMAZING NEW WATTAGE REGULATOR



GREATEST ADVANCEMENT IN AUTO IGNITION SINCE THE SELF-STARTER
DRIVE WITH OR WITHOUT BATTERY
100,000 MILE MONEY BACK GUARANTEE
STATE MAKE AND MODEL OF CAR AND SEND FOR FREE CATALOG
SCIENTIFIC ELECTRIC CO P.O. BOX 21422 P2 STAN CLEVELAND 8 OHIO

DRILL PRESS OWNERS!

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THE BARRON MULTI-PURPOSE ROTARY WOOD PLANER

PLANES & SURFACES • PANELS & BEADS
ROUTS & GROOVES • RABBETS • TENONS

$7.50 COMPLETE

Finest precision performance—certainty of skilled workmanship—time-saving, money saving short cuts—yours with world famous Barron Drill Press Tools. Fifteen important operations—all available on any standard drill press—with Barron Accessories. Equip your shop with these versatile exclusively designed tools—and save up to $500. 200,000 Barron owners have bought on our liberal 10 day full money back guarantee. Order, or write for catalog.

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DRIVE 3 TO 6 DAYS A MONTH

Gas Free!

Users claim and exhaustive tests have proved that the REMARR AUTOMATIC GASOLINE INJECTOR saves up to 20% on gas, boosts power and pick up on all cars, light trucks and tractors. Install it easily and test for 30 days on your car. IF NOT COMPLETELY SATISFIED, RETURN FOR FULL REFUND. List your name, address, car make, year, model and no. of cylinders.

Free Literature on Request **$9.95** Postpaid, $1 C.O.D. Deposit

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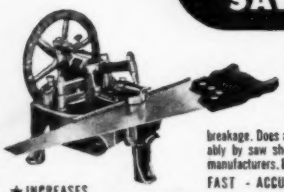
BeMaCo Dependable AUTOMATIC SAW SET



Sets 400 teeth per minute on hand or band saws 4 to 16 point. Hammer and anvil action sets teeth accurately and uniformly . . . No tooth breakage. Does a perfect job. Used profitably by saw shops everywhere and saw manufacturers. Every machine guaranteed!

FAST - ACCURATE - DEPENDABLE

★ INCREASES PROFITS

BEAVER MFG. CO.
SAW MACHINE Div. 11-A
800 SOUTH ISIS AVE. • INGLEWOOD, CALIF.

AMAZING NEW WOOD-TURNING TOOLS!

Outlasts Steel Up to 50 to 1!

SHARPEN ONCE IN 12-YEARS! (UNDER NORMAL USE)

These remarkable tools tipped with TUNGSTEN CARBIDE will astound you with their performance. They work FREE HAND equally well in wood, plastic or soft metals—and at the same time hold their razor-like edge almost indefinitely. Tests show that they will turn wood or plastic for days and days CONTINUOUSLY without showing any signs of dulling. They are the finest tools available at any price. Beautifully finished 5" blade—flush ground, polished tip—finest brass tube ferrule—9" hardwood handle—over all length 14"—25 tools to choose from: round & square nose from 1/8" to 1/2";—1/8 and 3/16 cut off; 1/2"x30° skew, spear, r. & l. skews, turning parting. Amazingly Low Prices! Write at once for free literature.

JOHNS MFG. CO., DUNELLEN 15, N. J.

SAVE UP TO 85% IN WAR SURPLUS FROM AT "GADGETEERS HEAVEN"

HYDRAULIC CYLINDER SPECIAL

Gives 20,00 lb. thrust (push-pull) using 1500 PSI line pressure as obtained from our hydr. pumps. Or will produce 40,000 lb. thrust with 3,000 lb. line pressure. Can ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1½" dia. piston shaft, 18" stroke, length: 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road, farm, & shop machinery, presses, etc. Cost Gov't $390.00 . . . . . **29.95**

We carry the World's largest supply of Special Hydraulic Equipment featuring over 20,000 cylinders in 61 sizes and types. Can also supply all accessories such as Pumps, Valves, Tanks, Hose and Fittings. Write for information.

No. 3 HYDRAULIC CYLINDER

Double action. Bore is 1". Shaft is ½". Has a stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 1100 lbs. **5.75**

No. 9-E HYDRAULIC CYLINDER

Double action cylinder. Has a bore of 1-3/8" and shaft of 1". Stroke is 9". Overall length 15¾". Built for 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 2300 lbs. Can be adapted to hundreds of uses **9.75**

4 WAY VALVE

Poppet, piston type. Off at neutral. Built-in relief valves for limit of cyl. stroke. Inlet & outlet 5/8" AN tube. Cyl. ports ½" AN tube. **9.75**

STRATO-POWER PUMP

With built-in variable flow control valve in head. Positive displacement piston type. Displaces .450 cu. in. per revolution. 2 gal. per min. cap. at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous, 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent maximum 4500 RPM. Rotates either direction without adjustment **19.50**

VICKERS HYD. VARIABLE DISPLACEMENT PUMP

Will deliver maximum volume at any pressure setting between 600 & 900 PSI. Desired pressure settings obtained with adjusting screw. Pump housing serves as reservoir for system. Has built-in compressed air supercharger which makes system independent of outside atmospheric pressure. Rotation is left hand only. Maximum speed for continuous duty is 3750 RPM. Displacement is .484 cu. in. per revolution at approx. 4 GPM at 1750 RPM. **32.50**

ROPER HYDRAULIC PUMP UNIT

Here is a complete Hydraulic pumping unit. Consists of a 300 PSI Roper pump with a 1/3 HP, Leland, heavy duty, roller bearing motor. Motor operates on 110 V AC – 60 cycle current and is directly coupled to pump with rubber universal joint. Unit is mounted on aluminum base with carrying bar. Can be used for transfer pump, power for small hyd., presses, cooling for lathes or in most cases where hydraulic power is used. **97.95**

SURPLUS COMPUTER GUNSIGHT

GADGETEERS! HOBBYISTS! INVENTORS! SCIENTISTS! Here is the 'Buy' of a Lifetime! Here, in one unit is approximately 50 precision bearings in many sizes, differential gears, miniature, matching bevel gears, spur gears, worm gears & drive shafts. Two constant speed mechanical governors, one 24 volt motor (1.50 HP, 3000 RPM), switches, optically perfect mirrors & lenses & a host of other parts. The Best That Money Can Buy! Cost the Gov't approx. $1700. NOW ONLY **27.50**

3 SPEED TRANSMISSION

Converts a high RPM, low power input into low, RPM, high torque output. Has 2 take-off shafts at 4 to 1 & .16 to 1 ratio. Gear box has worm drive bronze gears & throw-out clutch. Will operate forward or reverse directions. Adaptable to many uses on power machinery. **19.95**

VICKERS HYDRAULIC TRANSMISSION

Self contained, 2 H.P., constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output RPM –0 to 1/3 input RPM in both directions.. Input RPM 1800 continuous. 4000 intermittent. Dash pot can be removed for greater RPM. Ideal for lathes, duplicator set-up of mills, conveyors, small cars, drives, gearings, etc. **37.50**

4" SPLINE SHAFTS for input & power take-off . . . **2.50** PR.

The two transmissions above can be combined to make an excellent "power booster" or speed controller for many types of power machinery.

ELECTRIC GYRO

Turns up to 50,000 RPM. Electric drive motor is integral part of balance wheel. Has double end shaft to drive precision tools or machinery at precise, controlled speeds. Ball bearing mounted. Runs on high or low voltage. Ideal for experimental work, labs, hobbyists, technicians, etc. **4.95**

CARBON PILE VOLTAGE REGULATOR

The most dependable type voltage regulator used by the Armed Forces. Suitable for use with any 24 to 28 volt generator (see above). Accurately regulates flow of voltage at any setting between 20 and 30 volts. Comes complete with mounting base. . . ONLY **6.75**

ELECTRIC MOTORS

LEAR ELECTRIC MOTOR. 24 volt, 5 amps, series wound reversible motor . . . with overload clutch. Motor turns 11,000 RPM. Has 11 to 1 gear reduction box turning 1000 RPM at take-off. Adaptable to flex or rigid drive. Limit switch box. Size: 10" x 4" **7.95**

SAMSELL MOTOR

27 volts, 16 amps, 1/5 H.P. reversible, series wound on motor. 3800 RPM, shaft 9/32" diameter. 12-spline. 4-1/8" x 2-3/8". ONLY **3.95**

SURPLUS MOTORS

No. 500 – New 1/2 H.P. – 27 Volt, D.C. – A.C. This motor can be readily adapted to deliver up to ½ H.P. on 110 Volts, A.C. by the simple method of rearranging armature brush-leads. Free Diagram with each order. A SENSATIONAL VALUE. **5.95**

No. 500-A – Converted to 110 Volts, A.C. Equipped with plug and 3½ ft. heavy duty cord . . **8.49**

HYDRAULIC ACCUMULATOR — Type A–5, Vickers. Used to maintain constant pressure in both the "line" and reserve storage and to permit instant action in the hydraulic system. Built to stand 2000 PSI. 10" in diameter. Write for list of our other accumulators and our huge stocks of hydraulic supplies. **19.75**

ELECTRIC ACTUATOR

Hundreds of uses for any mechanical device needing controlled 2 way action. Opens, closes, raises or lowers doors . . windows . . . gates . . valves.

CTU-2 Foote linear actuator. 24V. A.C. 8500 R.P.M., 1/6 H.P. – Series wound motor. 4½" stroke in 13½ seconds. Compression and tension loads up to 750 pounds. Adjustable micro-switch for limits of travel. Overall length retracted: 11" **6.95**

GEAR HEAD MOTORS

Heavy duty G.E. Gear Head Motor. 1½ H.P., 24 volt D.C., 125 Amp. reversible motor will drive reduction gear box unit 44.5 to 1, resulting in 168 R.P.M. at 5/8" diameter take-off shaft. Motor contains electro magnetic brake

UNIT COMPLETE **10.95** MOTOR **4.95**

GEAR BOX ALONE **7.95**

FAMOUS PALLEY GADGET MIXES

A valuable "stock pile" of small parts & supplies for the hobbyist, mechanic, etc. Each item packaged separately in generously assorted sizes and types of - - - SCREWS, NUTS, BEARINGS, ABRASIVES, HINGES, SPRINGS, PULLEYS, RIVETS, FILES, ETC. Have these assorted mixes handy when you need them. SAVE TIME & MONEY! Write for complete, illustrated literature and special, LOW PRICES!

HYDRAULIC POWER UNIT!!

Complete hydraulic pumping unit. All necessary parts assembled & ready to work at a great saving in time and cost to you. Delivers 3½ GPM at 1500 PSI at 1800 RPM. (other volumes and pressures can be attained by simple adaptations) Unit consists of a gear pump driven by a 2½HP, DC motor (4000 rpm max.), relief valve, pressure unloading switch, filter, accumulator, reservoir with sight gauge & complete plumbing. Mounted on 19"x 25" aluminum panel. Complete with 24V-DC motor. (Other motors of any current can be adapted) **49.95**

NOW! MAKE YOUR OWN ARC WELDER!

HERE'S A REAL BUY! Finest, Precision built, R-1 Generators, Originally used on B-29 airplanes. These generators cost the Government approx. $400.00 each. Gives from 300 to 400 amps. at 27 volts. Ideal for all welding, light and heavy, up to 5/8" thickness. Free instructions for converting to welding unit **27.95**

OTHER AIRCRAFT GENERATORS

P-5 . 12 to 15 Volts 50 Amps $12.95

P-1 . 27 VOLTS . . 200 AMPS $15.95 P-3 . 27 VOLTS. . . 100 AMPS $25.00

Special GENERATOR BARGAIN

PG-1 . 27 VOLT. 140 AMP. **16.95**

P-12 .. 27 VOLT.. 75 AMP. **15.95**

AIRCRAFT CABLE

Rust resistant, alloyed steel. Extra flexible. Pre-formed, 7 x 19 strand. On reels.

1/16" – 4½c ft.	7/32" – 10½c ft.
5/64" – 5c ft.	1/4" – 12½c ft.
3/32" – 5½c ft.	9/32" – 15c ft.
1/8" – 7c ft.	5/16" – 16½c ft.
5/32" – 7½c ft.	3/8" – 18c ft.
3/16" – 9½c ft.	1/2" – 20c ft.

SPECIAL 3/16" cable, 18 feet long, with turnbuckle ends. . .99c

Stainless Steel Cable – Pre-Formed

1/16" – 6c ft.	5/32" – 20c ft.
3/32" – 14c ft.	1/4" – 26c ft.

Bronze Cable – Not Pre-Formed

1/16" – 5c ft.	3/16" – 23c ft.
1/4" – 17c ft.	1/2" – 38c ft.

Plow Steel Cable Hemp Center 6 x 19

7/8" . . . . 25c ft. — 1" . . . . 28c ft.

FIRE EXTINGUISHER

Kiddie Lux – CO^2 Type. Built to Gov't specifications. Heavy, shatter-proof case. Recent hydro-static test. Reconditioned and fully charged. LIKE NEW! READY FOR INSTANT USE!!

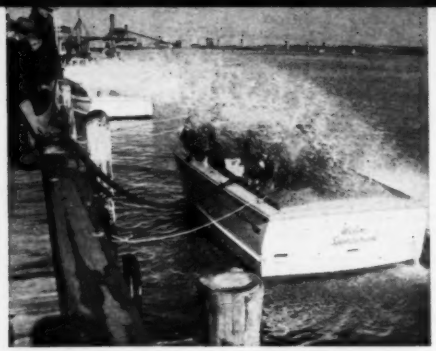
2 lb. size with Swing Nozzle . . 13.75
3½ lb. size with Swing Nozzle . . 17.95
7½ lb. size with Horn 23.75
10 lb. size with New Squeeze Grip Handle & 3½ ft flex hose with Horn. 29.75
15 lb. size with Squeeze Grip hdl, 4ft. flex hose, plastic horn.. $42.50
15 lb. size with Wheel Control . . 37.95

1952 CATALOG – 230 PAGES

COMPLETELY ILLUSTRATED, SHOWING 1000's OF ITEMS IN NEW and WAR SURPLUS! Some at SAVINGS UP TO 85%! Clothing, Household Items, Hand & Power Tools, Camping & Outdoor Equipment, and a huge stock of Hydraulic Equipment, including Cylinders, Valves, Pumps, Motors, Fittings, etc. Send only 50¢ for your copy of this amazing, bargain catalog today.

PALLEY SUPPLY CO 6321 SAN FERNANDO RD. DEPT. PS-3 GLENDALE 1, CALIF.

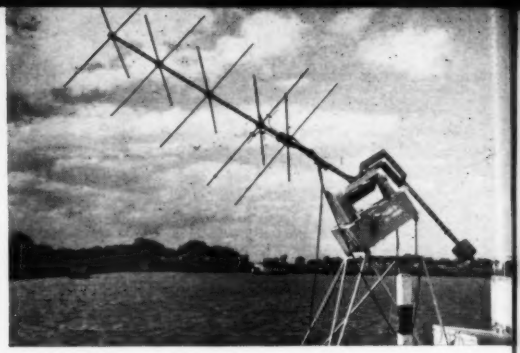
Order from this ad. Pay by M.O. or check. P.O's. accptd from D&B firms. ½ deposit with C.O.D's. All Prices FOB Glendale. All Sales are Final.



Boat Bails Itself, Can't Sink

EVEN when flooded with thousands of gallons of water, this 26-foot steel cruiser didn't sink. A hose (above) pumped in 18 inches of water, which ran out through scuppers in the cockpit as fast as it was poured in. Then the scuppers were plugged and more water pumped in to a depth of about three feet—still the boat stayed afloat. And the engine, although under water, ran smoothly inside its watertight casing, breathing through vents like submarine snorkels.

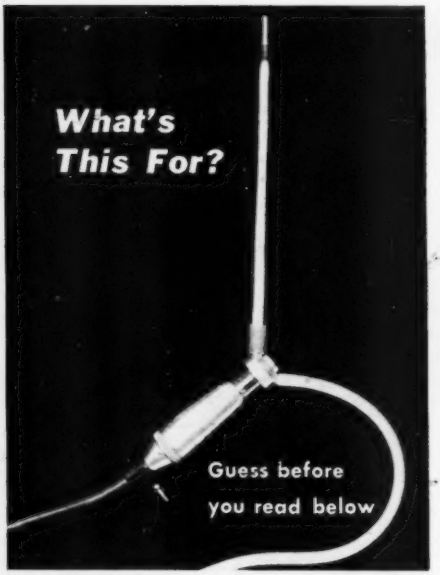
Secret of the Welin craft's buoyancy is two steel air tanks under the cockpit deck. In addition, locking a watertight door makes the forward cabin an air compartment.



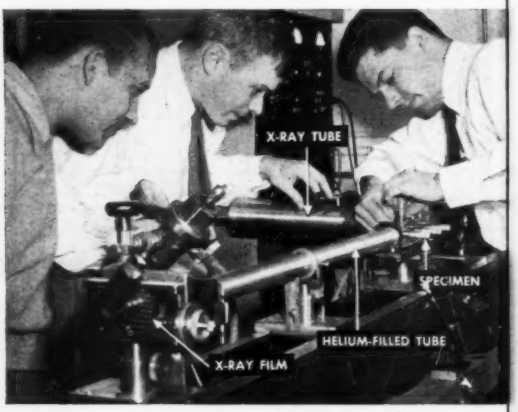
Antenna Tunes in on Sun

THIS "Yagi" antenna listens in on solar noises—called "bursts"—and follows them as they speed outward in the sun's atmosphere. It is one of many unusual antennas that are being used by Australian radio astronomers at Sydney to wrest new secrets from outer space.

Signals originating in the moon, they say, indicate that the earth's satellite is a pretty barren place covered with lava and volcanic dust. The scientists have also bombarded the moon with radio signals and received return echoes. Mars and Venus are next. As a result of the studies, new radio maps of the heavens are being drawn.



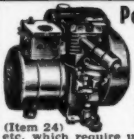
No, it's not a grease gun. It's a microphone with a long probe for picking up sound in hard-to-reach spots. Probe carries sound to mike at its base, and curved tube kills echoes. R. W. Leonard of University of California at Los Angeles designed it.



Tiny X-Ray Photos Enlarged

THE microscope above takes X-ray pictures of minute biological specimens and blows them up 150 times. Enlargement is done by picking up the X rays passing through a specimen and slanting them off four mirrors. The microscope operates in helium, which, while not injuring live tissues, chases out air that would absorb some of the X rays. It was developed by Stanford University scientists.

BUY DIRECT - MASTER MECHANIC - UP TO 85% DISC.



Portable LIGHT PLANT

PUSH BUTTON START

500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1¾ hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. **Be prepared if war or storm knocks out power lines.**

(Item 24)

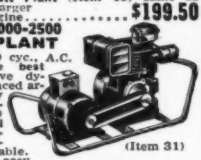
Reg. $275.00 value..... **$143.50**

700-800 Watt Plant (Item 44) **$169.95**

Same as above but greater output.

1000-1200 Watt Plant (Item 45) same as Item 24, but larger generator & engine..... **$199.50**

GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 V. 60 cyc., A.C. **Absolutely the best made** — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine —complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00. Special at.... **$299.50**

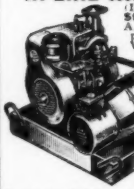
With Electric Self Starter (Item 179) **$359.50**

GENERATOR ONLY and control box. Drive it with your engine or tractor. **$169.50**

TRANSFORMERS—Convert 110 v A.C. to 220 v. Capacity 2 kva. Simple hook-up. Regularly $55. Our price—when purchased with light plant..... **$27.50**

Purchased separately $34.50.

HI-LINE 6000 WATT PLANT



(Item 162) **Push Button Start**, 115-230 v. 60 cycle A. C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 500 lbs. Easily worth $995.00, (with self starter)

Factory special..... **$645.00**

Same plant (with crank starter) (Item 166). Wt. 570 lbs.... **$585.00**

Generator and control box only, belt driven. Use your engine or tractor. **$345.00**

Wt. 240 lbs.....

We Are World's Largest Direct Factory Distributors of Light Plants

You can pay more — but you can't buy better

D. C. GENERATOR

(Item 92) Model P1, 2½ V. 250 amps. for marine, aircraft or truck duty. Make welders, light plants, etc. Has ⅞" splined shaft, can be turned down to ¾" round if desired. Warranty, in guaranteed operating condition. Wt. 53 lbs. Cost govt. over $300.00. Special..... **$22.50**

32 pc. SOCKET SET

32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. Beautiful, chatched chrome alloy, absolutely the best. Complete range of 21 sockets from ¼" thru 7/16" in ¼" drive and 7/16" thru 1-1/16" in ½" drive; 2 extensions, reversible ½" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, ¼" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. Easily worth $41.50. While they last. **$16.95**

ELECTRIC HAND SAW

(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides max. power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6½" comb. blade, ripping guide and 10 ft. hvy. duty cord. Built-in sawdust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2¼". 1 year written guar. Wt. 12 lbs. Drastically reduced..... **$39.95**

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HEAVY DUTY D-C ARC WELDER

(Item 38)

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¼" plate using ¼" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs.

A $4000 value at..... **$99.75**

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing and welding. Special..... **$119.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.... **$10.50**

Variable Speed Selector

(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary syster.. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation. 3 sizes: 1/2-1 hp. wt. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Brand new, in Goodrich boxes and guaranteed. Complete installation data included. Unprecedented surplus sacrifice **$79.50, $89.50** and **$114.50.**

Automatic Electric WATER HEATER

(Item 76) Immersion type 115 v. AC—1250 watts. Convert your present tank to modern automatic hot water heater. Long life Westinghouse or Chromalox element screws into std. 1¼ in. opening in tank. Adjustable thermostat keeps water at desired temp. Can also be used in washing machine or tub. Wt. 8 lbs. Heater element and thermostat regularly $49.50. Special..... **$14.95**

Heater only, for manual control. Wt. 3 lbs. **$7.95**

FIRE EXTINGUISHER

(Item 39) Fully charged (at 1,000 lbs. P. S. I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe — keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that gives available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. $19.50 value. Special..... **$6.95**

POTTERS WHEEL

(Item 47) Complete, prof. equip. for making ceramics and pottery. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and wedging wire. 16x12" enclosed throwing table—ample area for largest pieces. Reg. ¼ hp. motor (not incl.). Can be set up on 20x24" table and stored on edge. Complete with pulleys, belts and instructions. Wt. 26 lbs. $145 value at..... **$59.95**

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TERRIFIC VALUES!

New genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. **Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil. Save more than 60%.**

(Inside Diam.)	1"	1¼"	1½"	1¼"	1½"
Length	10 ft.	25 ft.	50 ft.	100 ft.	30 ft.
Price	5.95	9.25	24.75	49.95	14.75

If specified we will send special hose for gas or oil at same prices.

COMMANDO BIKE MOTOR

(Item 90)

New, super-modern 1952 model. This job is the Cadillac of all bike motors. Sensational Auto-Clutch prevents killing motor at each stop. Also selects proper ratio on hills. Mounts behind and drives rear wheel with Dynamotor. Free Wheeling lever permits pedalling if desired. Rear Mounting eliminates fumes, heat, dirt, and hard steering. Easily installed in 15 minutes with home tools. Sturdy, trouble-free, easy starting, light weight. Airplane type engine: up to 150 miles per gallon. Fully guar. Ride for fun or profit. Ideal for deliveries, paper routes, messenger service, etc. Ride to work and save. **Dealer inquiries invited.**

The Commando Captain, 1 cylinder 1½ hp..... **$99.75**

The Commando General, 2 cylinder 3 hp. (Item 91)..... **$125.00**

All Commandos shipped prepaid in U.S.

TRENCH-LAY WIRE

(Item 191) #14-2 Cond. — for buried service to lights, etc. Absolutely impervious to soil or moisture. Each conductor consists of two #17 solid wires encased in tough Neoprene. Twist ends together for #14 cap. Min. order 100 ft., Wt. 7 lbs. Terrific bargain. 8c per ft.

EXTENSION POWER CABLE

#12-2 Cond. — stranded, flexible, rubber covered and shielded: with heavy duty plug and outlet: finest power cable made. 50 ft. (Wt. 8 lbs.) **$6.95**; 100 ft. (Wt. 16 lbs.) **$12.95.**

#8-2 Cond.—rubber cov.—50' lgth. **$20.** #4-2 Cond.—rubber cov.—50' lgth. **$27.**

EXTENSION CORD

(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft. **$1.99**

Comb: 2-40 ft. and 1-20 ft. (total 100 ft.. **$4.95**

100 foot length (one piece)..... **$4.85**

WIRE ONLY (Item 50) No fittings, 100 ft. **$8.00**

CARRY-AIR

(Item 32) Corrosion-resistant steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 10 lbs. Worth $20.00. Our price..... **$8.95**

(Item 55) With big double tank (1000 cu. in.)..... **$11.95**

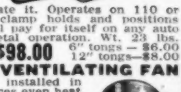
A.C. ARC WELDER

(Item 169) **Master Hi-Line Welder—20-100 amps.** output. Fast, dependable welding, brazing, soldering and cutting. Handles 24 gauge to ¼" metals. Will pay for itself in a few jobs. Easily controlled at any heat desired. Operates on 110-220 V. Portable and powerful. Handsome steel case 14" x 13" x 10". Wt. 65 lbs. Full instructions and guar. incl. Worth $125.00.

Factory price only..... **$64.95**

Welding Kit (Item 181) incl. helmet, 2 leads, electrode holder, ground clamp, power cord and rods (sold only with welder) Wt. 12 lbs. **$12.50**

PORTABLE SPOT WELDER



(Item 186) Cut costs drastically. Ten times faster than drilling holes and riveting or bolting. Makes high-strength welds instantly. Easily carried to the job. No skill required —a boy can operate it. Operates on 110 or 220 V. Built-in clamp holds and positions work quickly. Will pay for itself on any auto body or sheet metal operations. Wt. 23 lbs. Wholesale price..... **$98.00** 6" tongs — $6.00; 12" tongs—$8.00

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.). 8" Fan, wt. 5 lb. **$6.35**; 9" Fan, wt. 6 lbs. **$7.45**; 10" Fan, wt. 7 lb. **$8.45**; 12" Fan, wt. 8 lbs. **$9.45.**

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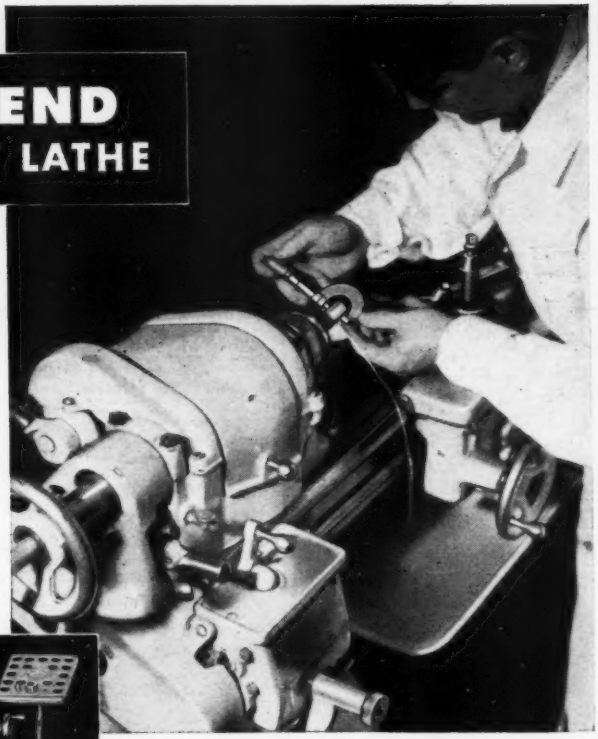

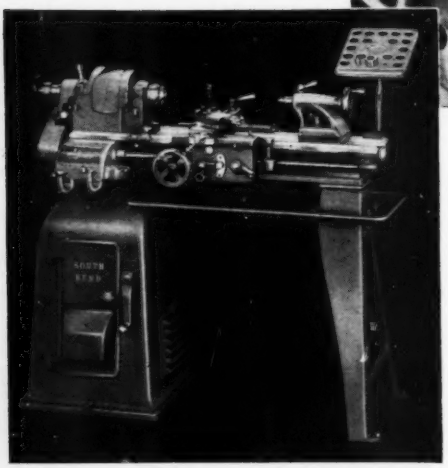

Built for exacting industrial work, the South Bend 10"-1" collet lathe satisfies the demands of any craftsman. Its accuracy simplifies precision jobs and permits work of the highest professional quality. This is the perfect tool for shop owners who want accuracy and versatility. Write for literature on the 10"-1" collet lathe and its many attachments.

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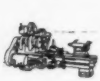
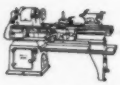
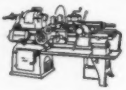


☐ 9" and 10" BENCH LATHES

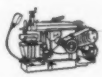


☐ 10" to 16-24" FLOOR LATHES



☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



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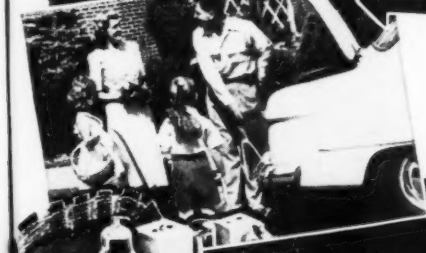

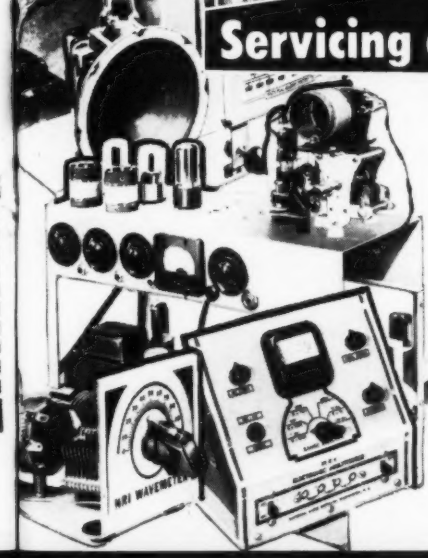

America's Fast-Growing Industry Offers You

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Many students make $5, $10 a week extra fixing neighbors' Radios in spare time while learning. The day you enroll I start sending you SPECIAL BOOKLETS to show you how to do this. You get practical experience building many pieces of equipment with kits I send. Tester you build helps you service sets. All equipment is yours to keep.

2. GOOD PAY JOB

Your next step is a good job installing and servicing Radio-Television sets or becoming boss of your own Radio-Television sales and service shop or getting a good pay job in a Radio or Television Broadcasting Station. Today there are over 90,000,000 home and auto Radios, 3100 Broadcasting Stations are on the air. Aviation and Police Radio, Micro-Wave Relay, Two-Way Radio are all expanding, making more and better opportunities for servicing and communications technicians and FCC-licensed operators.

3. BRIGHT FUTURE

And think of the opportunities in Television! In 1950 over 5,000,000 Television sets were sold. By 1954 authorities estimate 25,000,000 Television sets will be in use. Over 100 Television Stations are now operating, with experts predicting 1,000. Now is the time to get in line for success and a bright future in America's fast-growing industry. Many men I trained have good jobs in Radio and Television. My course includes fundamental facts on Television and you practice on circuits common to both Radio and Television. Be a Radio-Television Technician. Mail the postage-free card for actual lesson and 64-page book FREE.

I Send You Many Kits for Servicing or Communications Practice

Keep your job while training at home. Hundreds I've trained are successful RADIO-TELEVISION TECHNICIANS. Most had no previous experience; many no more than grammar school education. Learn Radio-Television principles from illustrated lessons. Get Practical Experience—experiment with circuits common to Radio and Television. My Training Features Television. Many students make $5, $10 a week extra fixing neighbors' Radios in spare time.

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You build equipment like that shown at left from many kits of parts I send. You get practical experience "bring to life" theory you learn in my illustrated texts. As part of my Servicing course you build a complete, powerful Radio Receiver, a Set Tester, an AM and FM Signal Generator, etc. In my Communications Course you assemble a low-power Broadcasting Transmitter, a Wavemeter, an Electronic Multitester for measuring voltage current, resistance, impedance, etc. All equipment is yours to keep.

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Act Now! Send for my FREE DOUBLE OFFER. Card entitles you to sample lesson on Servicing; shows how you learn Radio-Television at home. You'll also receive my 64-page book, "How to Be a Success in Radio-Television." You'll read what my graduates are doing, earning; see photos of equipment you practice with at home. Mail card today. No postage needed. J. E. SMITH, President, Dept. 2CB, National Radio Institute, Washington 9, D. C. Our 39th year.

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"Am tied in with two Television outfits and do warranty work for dealers. Fall back to N.R.I. text books often." —Robert Dohmen, New Prague, Minn.

"Before finishing your course, I earned as much as $10 a week in Radio servicing, at home in my spare time." —S. J. Petruff, Miami, Florida.

"I have been operating my own Servicing business. In two years I did $14,000 worth of business; net profit, $6,850." —Phillip G. Brogan, Louisville 8, Ky.

"When halfway through the N.R.I. course, I made $5 to $8 a week fixing sets. Now selling and installing Television sets." —E. J. Streitenberger, New Boston, Ohio.

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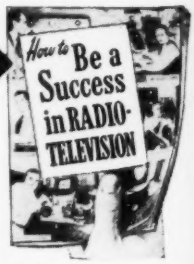

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See Inside

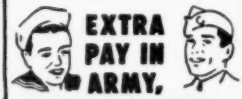
Read what Successful NRI Graduates Say—

"I received my License and worked on ships. Now with Station WEAN as control operator. N.R.I. course is complete."—Raymond D. Arnold, Rumford, R. I.

"Have my own shop. Am authorized serviceman for 5 large manufacturers. N.R.I. has enabled me to build an enviable reputation in Television."—Paul Miller, Maumee, Ohio.

"People honor the N.R.I. trained man. They say if you are trained by N.R.I. you know Radio repair business."—Preston Purkiss, Pangburn, Arkansas.

"My first job was operator with KDLR, obtained for me by your Graduate Service. Now Chief Engineer of Police Radio Station WQOX."—T. S. Norton, Hamilton, Ohio.



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